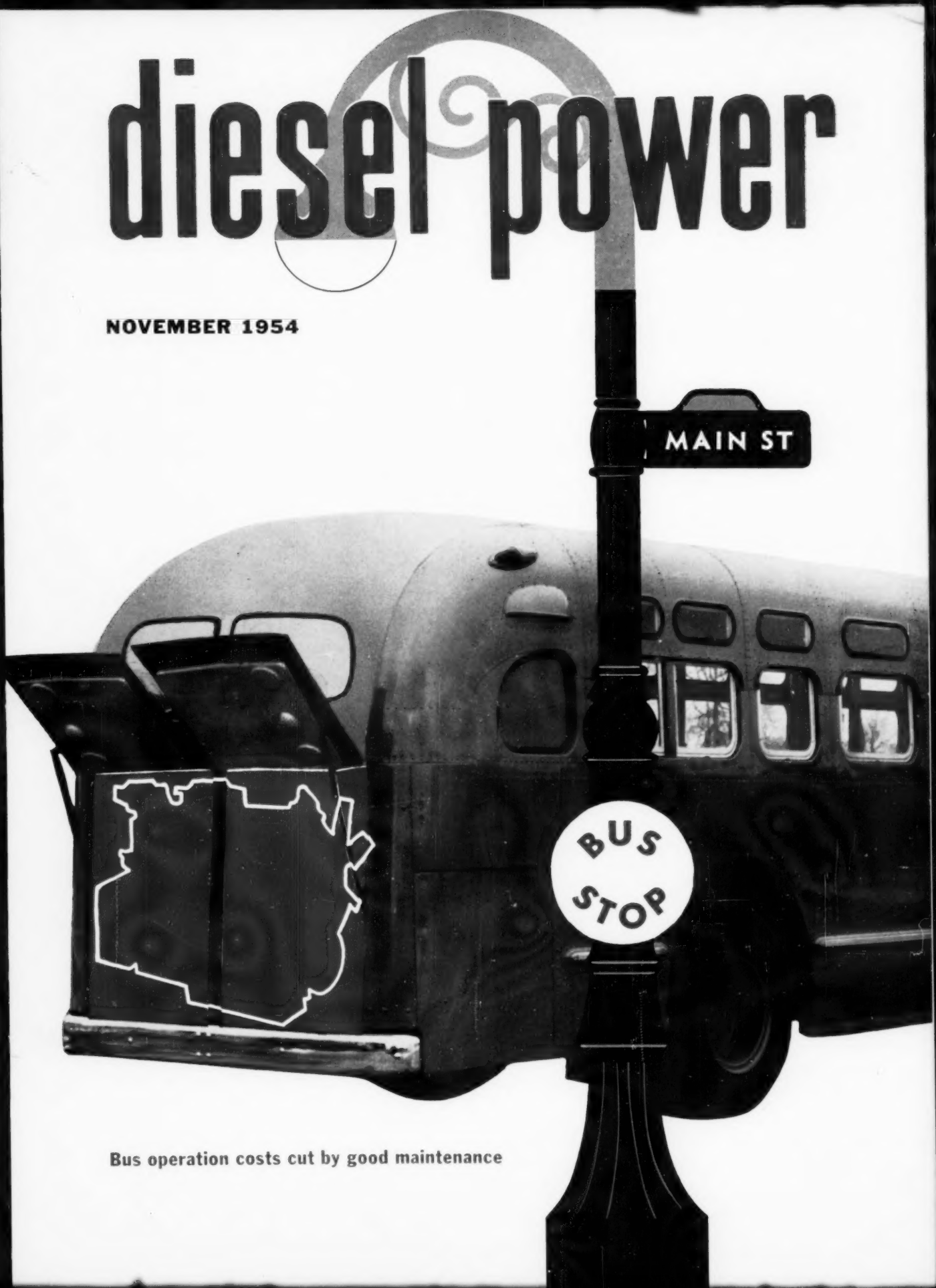
diesel power

NOVEMBER 1954



Bus operation costs cut by good maintenance

THIS BATTERY of gas engines in a Texas plant (name on request) has been exclusively lubricated with *Texaco Ursa Oil P* for many years. Efficiency has been outstanding — rings, bearings and cylinder liners in A-1 condition, parts life notably long, maintenance costs low. For similar benefits, use one of the *Texaco Ursa Oil* series.

TUNE IN . . . TEXACO
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starring DONALD O'CONNOR
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Saturday nights,
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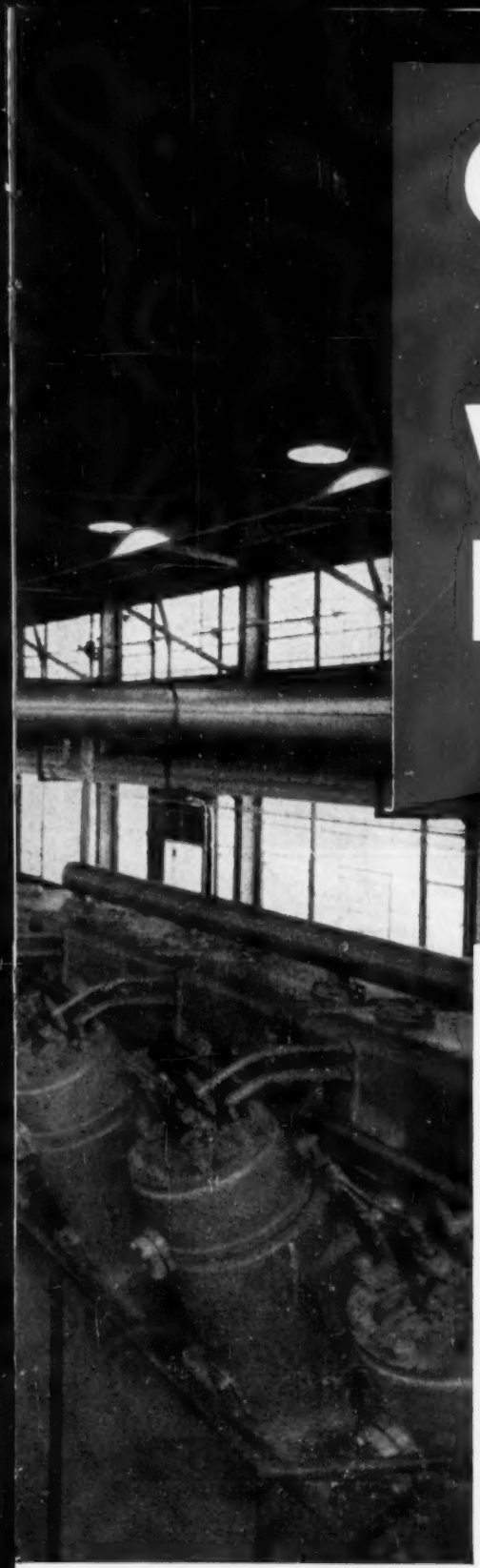
TEXACO

TEXACO



GET MORE POWER WITH LESS FUEL . . .

WHETHER you're running diesel, gas or dual-fuel engines, the right lubricating oil is the one that is exactly suited to the type of engine, the fuel used and the operating conditions. To be sure of the right oil, use one of the famous *Texaco Ursa Oil* series.

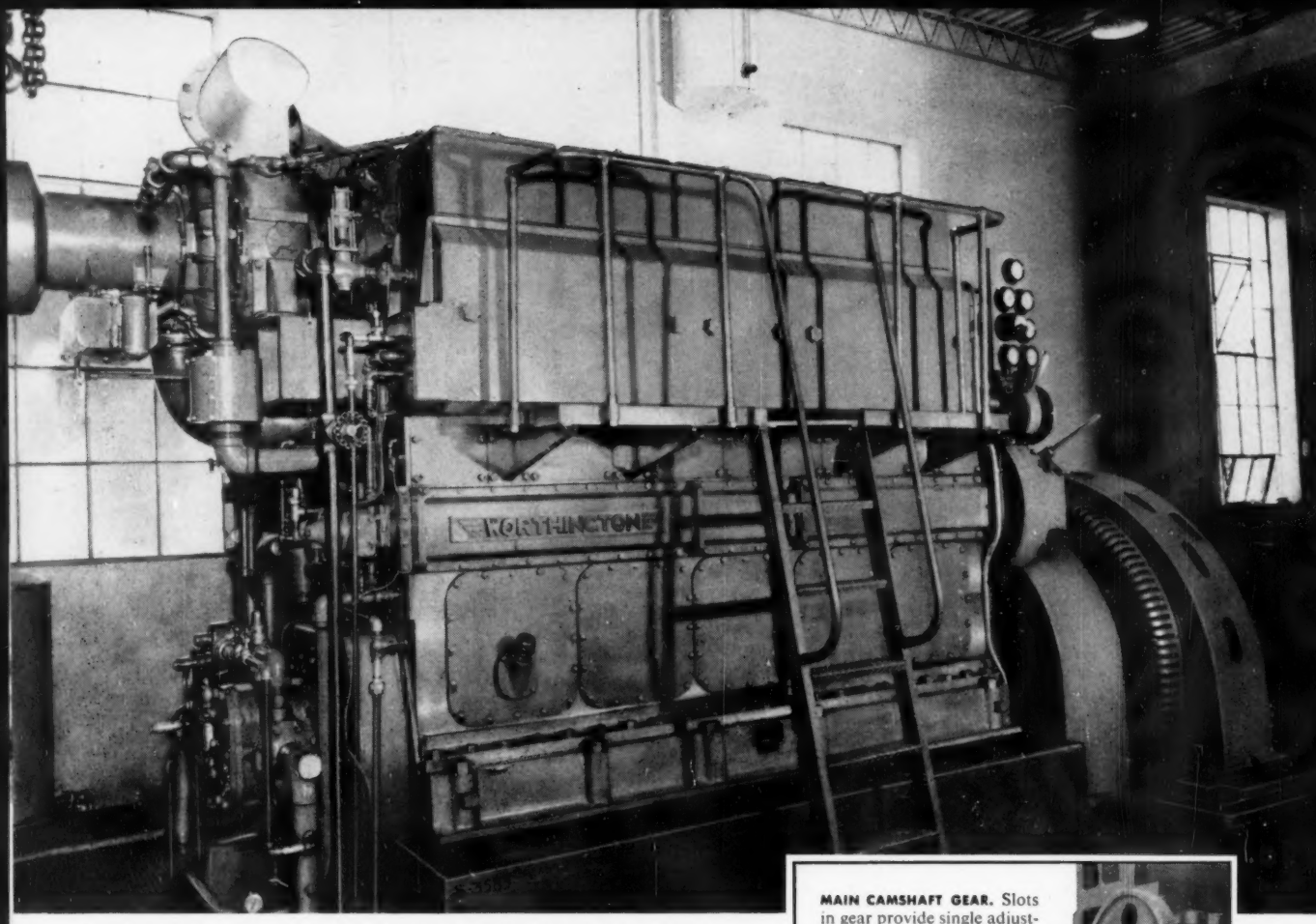
The *Texaco Ursa Oil* series is a complete line of lubricating oils especially refined to make diesel, gas and dual-fuel engines give *more power* with *less fuel* over *longer periods* between overhauls. These benefits explain why —

For more than twenty years, more stationary diesel horsepower in the United States has been lubricated with Texaco than with any other brand.

Whatever the engine — its size, type, speed or fuel used — the right lubricant for it is in the *Texaco Ursa Oil* series. Your Texaco Lubrication Engineer will gladly help you select it.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES



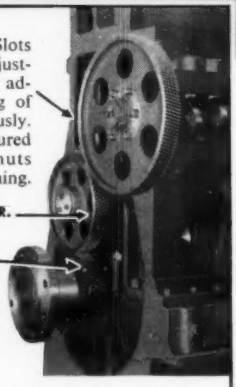
NEW SUPERCHARGED WORTHINGTON TYPE SDR DIESEL ENGINE in the Grand Marais Light and Power Company was specified for its economy of fuel consumption.

Grand Marais, Minn., installs second Worthington Diesel

Six years of efficient performance from their first Worthington Diesel left no doubt as to Grand Marais' choice of a second engine. When demands for power increased, they installed the new Worthington Diesel shown above.

This town, near the Canadian border, has no railroad. Thus maximum engine efficiency was most important in its decision, because of high fuel costs. The new Worthington SDR engine has already effected impressive savings in fuel, lubricating oil and maintenance costs.

Worthington's exclusive features increase your plant's efficiency, lower your operating costs. For more facts on Worthington engines—gas, Diesel or dual fuel—write for Bulletin S-500-B52A to Worthington Corporation, Engine Division, Buffalo, N. Y.



MAIN CAMSHAFT GEAR. Slots in gear provide single adjustment for retarding or advancing injection timing of all cylinders simultaneously. Final gear adjustment secured with castellated locknuts wired after final tightening.

FREE FLOATING IDLER GEAR.

SPLIT GEAR KEYED ON CRANKSHAFT. Permanent adjustment for perfect alignment with idler gear is easily accomplished.

WORTHINGTON HELICAL STEEL GEAR TRAIN
used on Worthington dual fuel engines . . .

1. Provides accurate and positive control of engine timing.
2. Is located at flywheel end of engine for smooth gear operation as power impulses are absorbed by the flywheel.
3. Uses controlled automatic oil jet lubrication that eliminates wear.
4. Assures correct engine timing . . . keeps engine running smoothly . . . results in low fuel consumption and minimum engine maintenance.

E.3.3

Worthington-Built Auxiliaries

ENGINE STARTING COMPRESSORS

OIL TRANSFER PUMPS,

COOLING WATER CIRCULATING PUMPS

EVAPORATIVE-TYPE ENGINE WATER COOLERS

Economical Continuous Power—Diesels, Oil and Dual Fuel, and Spark-Ignition Gas Engines, from 190 to 2,100 bhp.

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diesel power

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General Motors

announces a promising new tool for

Electric Utility Companies

Electro-Mobile Power

for interim boosting in fringe areas and emergencies – in 3 versatile, fully integrated Diesel units

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Now the Electro-Motive Division of General Motors presents, in 3 new forms, highly promising to electric utilities, mobile and portable Diesel-Electric generating plants engineered out of its two decades of experience in supplying Diesel-Electric locomotives to American railroads and containing many of the components proved in this grueling field.

General Motors railroad units today equal *one-sixth* of all the country's installed electrical generating capacity.

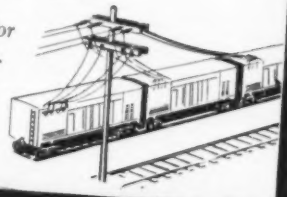
The controls that fit the new units to electric utility applications are the most advanced devices, employing the most up-to-date materials, in this field. Their engineering has taken advantage of science's latest contributions.

And to this development, Electro-Motive Division brings all the performance advantages and economies of mass production, and a single responsibility for all components of every unit.

We believe that here the electric utility field has a new and remarkably adaptable tool that will fit many problems in an unusually economical way. We'd like to discuss with you the potential benefits Electro-Mobile Power may hold for your specific needs.

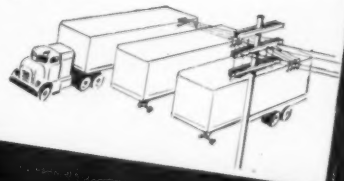
RAIL CAR

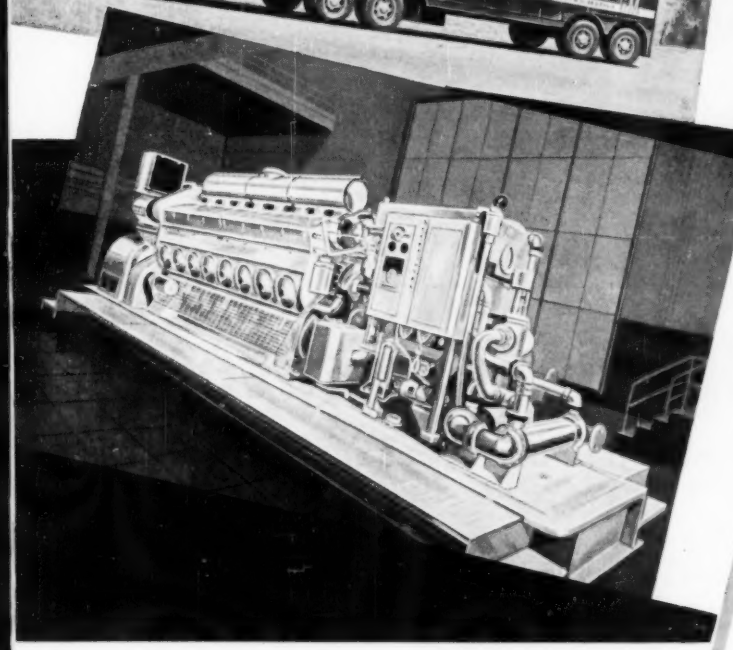
1,000, 750 and 500 kw units for use on sidings, or placed on piers for semi-permanent use.



TRUCK TRAILER

500 and 350 kw units to move on highways to desired sites.





PORTABLE UNIT

1,000, 750, 500 and 350 kw capacities for permanent or semi-permanent installations.

Electro-Motive Power FEATURES INCLUDE:

- Remote control starting and stopping
- From starting to full load within 45 seconds
- Automatic synchronization with line in phase, frequency and voltage
- Inherent 25% overload capacity
- Full protective equipment, including surge capacitors, lightning arresters, over-current relays, field failure relay
- Complete self-operation can be provided
- Ability to meet higher capacity needs by unit multiplication
- Complete national parts and service availability

Electro-Motive Division

GENERAL MOTORS

LA GRANGE, ILLINOIS

AN IMPORTANT ANNOUNCEMENT TO BUS OPERATORS

"Ethyl" Diesel Ignition Improver

. . . is being successfully used in diesel bus fuels

For over a year a large metropolitan diesel bus operator has been using diesel fuel whose cetane number has been upgraded with "Ethyl" Diesel Ignition Improver.

Previous to this, a 300,000-mile over-the-road test in diesel trucks and year-long tests in both railroad locomotives and in marine engines have proved that distillate fuels could be effectively upgraded with Ethyl's cetane-improving additive.

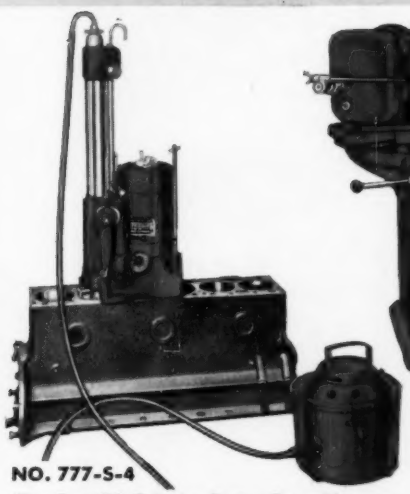
"Ethyl" Diesel Ignition Improver offers many advantages to bus operators. It makes available diesel fuels with lower pour points, higher volumetric heating value, and more uniform ignition quality. This tends to minimize cold-weather operational problems, increase operating economy, and reduce maintenance costs.

ETHYL CORPORATION

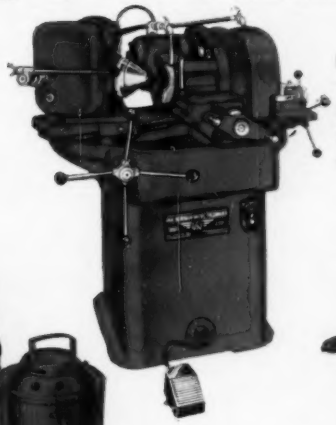
New York 17, New York

On Exhibition at the **Automotive Service Industries Show**

WORLD'S MOST COMPLETE LINE OF HEAVY-DUTY AUTOMOTIVE SERVICE MACHINES



NO. 777-S-4
"Per-Fect-O" Cylinder Boring Bar with vacuum chip-remover. Five other models available.

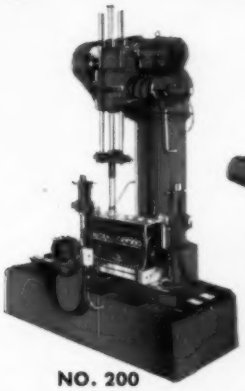


NO. 500-R
Valve Regrinder takes valves from ¼" to 1¼"; all angles from 15° to 75°. One of two models.

NO. 232
Pin-Fitting Machine for rods from 3¼" to 16" long. Pistons up to 6" diam., 9" long. Also New No. 232-R Rod Reconditioning Machine, for rods only.

NO. 101
High Speed Piston Grinder for pistons up to 11" long; 8" diam. Smaller model available (No. 76).

NO. 465
Crankshaft Regrinder: Capacity of 60" x 18". Six other models available.



NO. 200
Automatic Wet Honer duplicates the original cylinder wall finish of the engine manufacturers. Bore diameters 2⅞" to 8". Bore lengths up to 18". Max. stroke of hone, 18".

NO. 444
Rotary Surface Grinder reconditions clutch plates and clutch sides of flywheels up to 22" diam.

New NO. 302
Brake Drum Lathe handles drums up to 30" diam., 10" wide. Four other models.

New NO. 253
Camshaft Grinder: Distance between centers, 82". Max. diameter, 9". Quickly and accurately grinds car, truck, tractor camshafts, and crankshaft main bearings.

New NO. 562
Head Grinder takes heads, blocks and manifolds. Capacity: 46" long x 14" wide. Grinds wet.

. . . or write VAN NORMAN CO., Springfield 7, Mass.

The Best-Equipped Shop Gets the Business! *that's why* ***"It Pays to Van Normanize"***

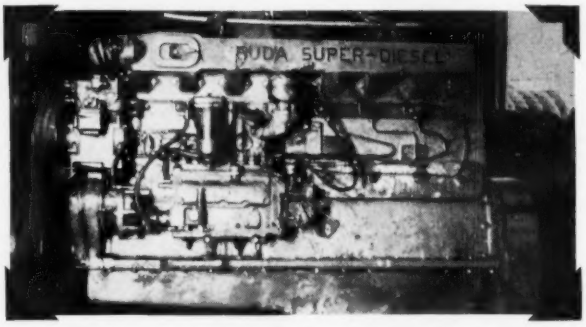
THE ENGINEER'S REPORT

DATA

LUBRICANT	RPM Delo Oils
UNITS	21 Buda diesel engines
OPERATION	Hauling ore
CONDITIONS	Heavy duty — 8-15% grades
PERIOD	6 years
FIRM	Bagdad Copper Corp., Bagdad, Arizona

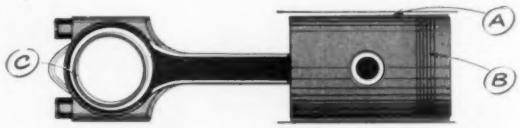
No stuck rings in 21 engines in 6 years hauling ore!

HAULING 22-TON LOADS up 8 to 15% grades out of the Bagdad Copper Corp. open-pit mine, 21 Buda diesels have had no stuck rings, no clogged ring grooves since using RPM DELO Special Lubricating Oil for the last 6 years. Engines operate 2 shifts a day, 6 days a week in heavy abrasive dust. Torn down after 7000 hours, all parts in the engine above were exceptionally clean and all bearings were good.



BIGGEST OFF-HIGHWAY TRUCK IN THE WORLD (above) was recently built for Bagdad Copper Corp. It weighs 96,000 pounds, hauls 75 tons. RPM DELO Special Lubricating Oil was also selected for its two 350 H.P. supercharged Buda diesels because of the excellent service Bagdad has had from this oil.

How RPM DELO Oils keep engines clean and prevent wear



A. Contain special additives that provide metal-adhesion qualities...keep oil on parts whether they are hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean, helps prevent scuffing.

C. Special compounds stop corrosion of any bearing metal, and oil foaming in both wet and dry sump engines.

There is an RPM DELO Oil to meet every heavy-duty engine operating condition.

FREE BOOKLET on the RPM DELO Oils gives you complete information. Write or ask for it today.

RPM DELO LUBRICATING OILS

STANDARD TECHNICAL SERVICE checked this product performance. For expert help on lubrication or fuel problems, call your Standard Fuel and Lubricant Engineer or Representative; or write Standard Oil Company of California, 225 Bush St., San Francisco.

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
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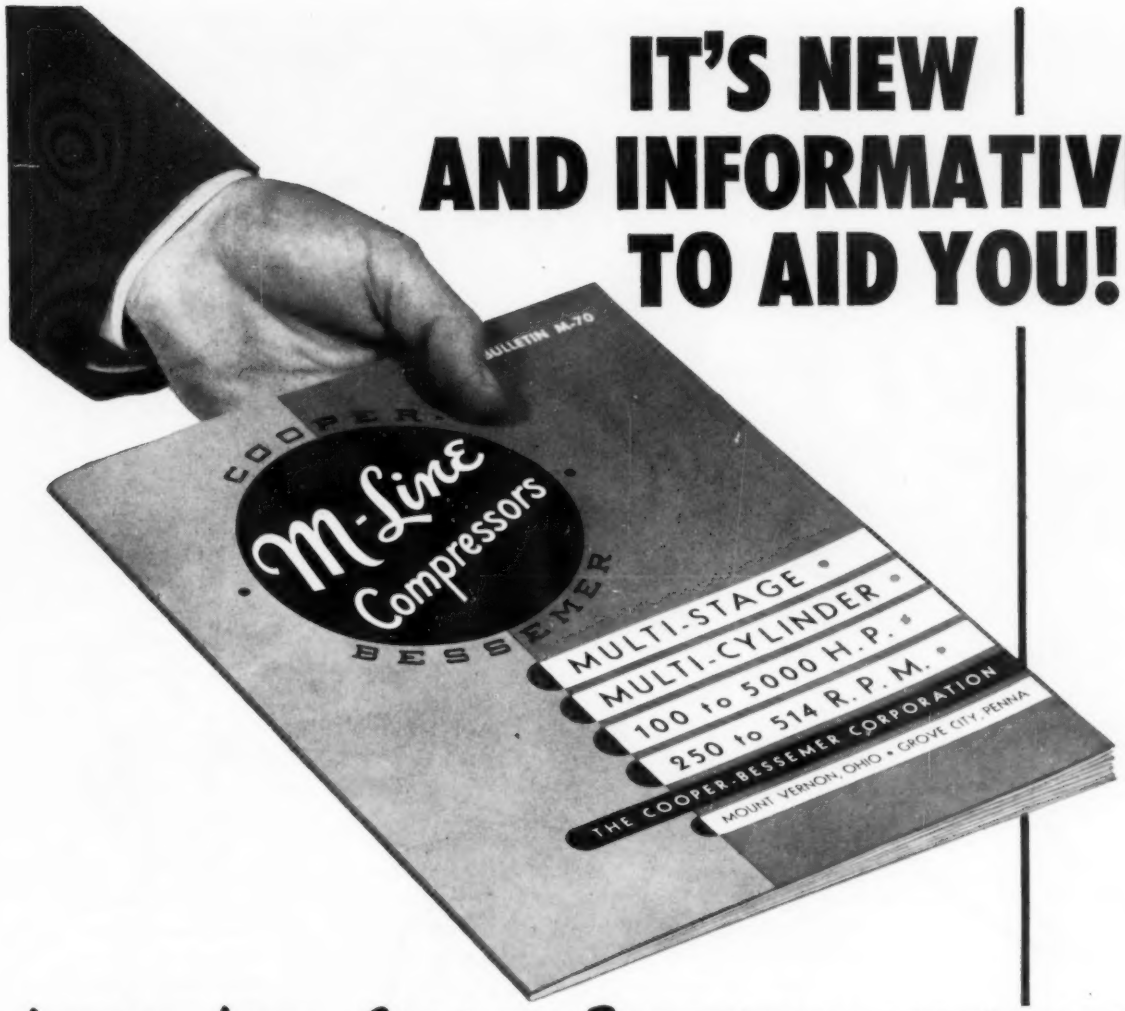
IT'S NEW | AND INFORMATIVE TO AID YOU!



Learn how Cooper-Bessemer compressors can cut your costs!

THE new Cooper-Bessemer M-Line Bulletin offers you complete information on economically meeting compressor requirements from 100 to 5000 horsepower. This interesting 44-page booklet simply and fully explains how and why Cooper-Bessemer compressors assure you maximum trouble-free performance at minimum operating expense.

Additional bulletin features include complete data on design, lubrication, automatic controls, cylinders, motor and drives, specifications and photographs of various compressor installations. Cooper-Bessemers offer you new, unusual plus features that are paying off in job after job. To find out about them, send for your M-Line Bulletin today.

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THE COOPER-BESSEMER CORPORATION 12
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Produced in all alloys up to 14-inch diameters, plain or graphited.

Light weight, heavy wall types, up to 14-inch dia.

CAST ALUMINUM ALLOY

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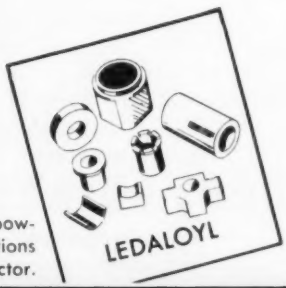
For many thin wall applications.



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Self-lubricating . . . molded powdered metal, serve applications where heavy duty is not a factor.

• • FOR DIESEL APPLICATIONS

As a pioneer in the diesel field, Johnson Bronze has developed sleeve bearings for every requirement. Outstanding is the Aluminum-on-Steel type for high loads and high speeds. Whatever your needs, depend on Johnson Bearings. Write for information.

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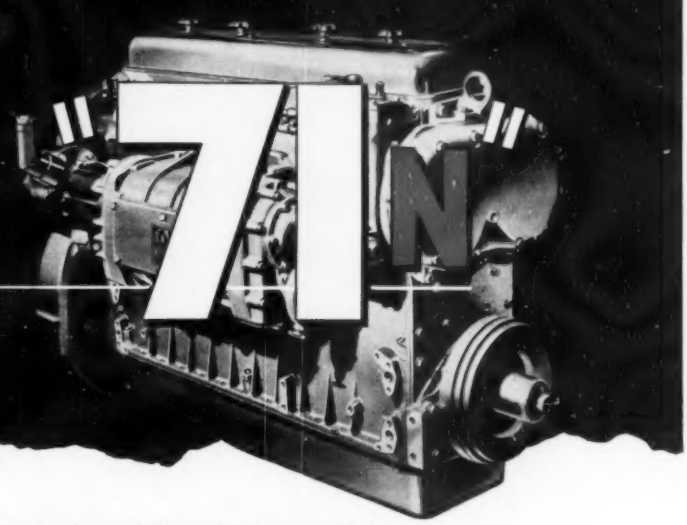
JOHNSON JB BEARINGS
Sleeve-Type

WE SHOULD CALL IT the 71N



"N" FOR NEW—*New Where It Counts Most*

You don't have to be an old-timer to remember when the first General Motors Series 71 Diesel was introduced. We called it the "71" in 1938 and we call it the "71" today.

But in 17 years these design improvements from top to bottom have given operators higher horsepower, lower fuel consumption and longer engine life. And now, a whole series of new improvements has made this fast-stepping, compact, 2-cycle Diesel better than ever.

NEW **17 TO 1 COMPRESSION** gives better fuel economy, squeezing more power from every gallon of fuel.

NEW **"FIGURE 8" CYLINDER LINERS** give you a cleaner burning, more efficient engine. Air intake area is increased 32% for more complete fuel burning and better exhaust.

NEW **IMPROVEMENTS IN PISTON PIN, PIN RETAINER AND CAM FOLLOWER DESIGN** mean longer life, less maintenance cost. High-valve unit injectors last longer because the valve assembly is away from high cylinder temperature areas. Hard-chrome steel "Lite-Tite" piston rings resist wear; are tougher and more flexible and give many more hours of service.

And—best of all—in your next overhaul you can incorporate any or all of these new improvements in any GM Series 71 Diesel engine you're operating today. "The Inside Story" tells you how these new improvements can help cut your costs and speed your jobs. Mail the coupon today for your copy.

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Single Engines . . . 30 to 300 H.P. • Multiple Units . . . Up to 893 H.P.

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General Motors Corporation
Detroit 28, Michigan

Please send me booklet "The Inside Story"

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"Smoother stripping -cuts cable costs"

Allison TORQMATIC equipped Osgood dragline owned by J. C. Kitzmiller Coal Co. Unit has 3-yard bucket, 80-foot boom; strips 1000 tons of coal per month

AFTER 2,000 hours of low-cost strip-mining, veteran mine owner J. C. Kitzmiller reports "smoother stripping – reduced cable cost" due to shock-free power transmission in his Osgood dragline. The savings he's made with his Allison TORQMATIC Converter have made him decide to specify Allison TORQMATIC DRIVES in future equipment.

He's spending less for cable replacement in his Osgood dragline because the TORQMATIC Converter protects cable by absorbing sudden shock loads.

He's spending less for dragline repairs, too. The TORQMATIC Converter gives the operator time to cut off power—"throw out the drag"—when the bucket hits a snag, guards boom and drive line from harmful overloads.

And he's getting more work from his drag because with fewer repairs it stays on the job *earning* money—out of the shop *costing* money.

The TORQMATIC Converter matches engine power to load demand, helps prevent harmful engine lugging and stalling. It multiplies engine torque up to 3½ times—broadens the engine's effective horsepower range.

When load demand is equal to, or less than, engine torque the Allison TORQMATIC Converter acts as a fluid coupling to conserve fuel, boost engine life. This feature is standard equipment in every Allison Converter.

You can produce more for less with shock-free TORQMATIC power transmission in your 40- to 400-horsepower gasoline or Diesel equipment. Ask your manufacturer or dealer about TORQMATIC DRIVES in your equipment or write for more information to: Allison Division of General Motors Box 894S, Indianapolis 6, Indiana

ALLISON TORQMATIC CONVERTER

Simple Design – one-piece cast converter elements – minimum maintenance

Compact, easy to install in existing equipment

Designed for power applications in the 40 to 400 horsepower range

Longer Equipment Life – absorbs shock, eliminates harmful engine lugging, cuts maintenance costs

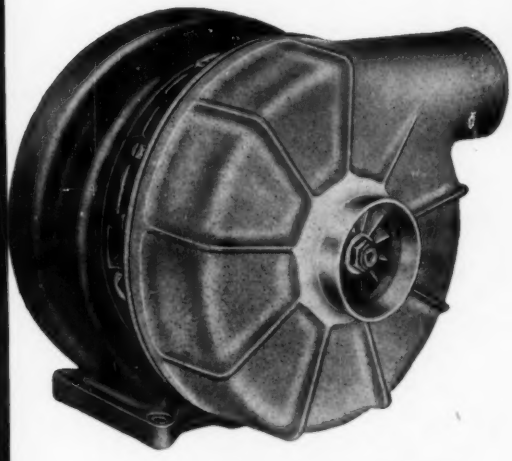
GM GENERAL MOTORS

Allison ★ **TORQMATIC DRIVES**

Compact, efficient hydraulic drives for Cranes * Trucks * Tractors * Scrapers * Shovels * Drilling and Servicing Rigs

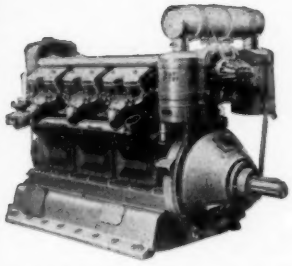
SCHWITZER-CUMMINS COMPANY *Superchargers*

POSITIVE DISPLACEMENT AND TURBO SUPERCHARGERS FOR INTERNAL-COMBUSTION ENGINES

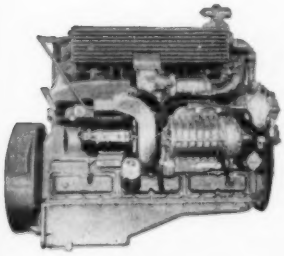


EXHAUST DRIVEN TURBOCHARGERS for engines 40 to 400 brake horsepower, naturally aspirated.

POSITIVE DISPLACEMENT SUPERCHARGERS for engine sizes from 50 to 500 HP, and pressure ratios of 2:1 max.



Model D-375—Caterpillar Diesel V8



Model HRBS-600
Cummins Engine Company, Inc.
(Used also on HBS Series)

For over a quarter of a century SCHWITZER-CUMMINS SUPERCHARGERS have received widespread recognition throughout the industry for their reliability, economy and unexcelled performance.

Superior engineering and skillful workmanship, backed by a multi-million dollar investment in up-to-date facilities, teamed up to develop this excellent product so that it is today first choice of leading internal combustion engine manufacturers.

SOME FAMOUS ENGINES SUPERCHARGED BY **SCHWITZER-CUMMINS**

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- COOLING FANS
- AIR STARTING MOTORS
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- OIL PUMPS
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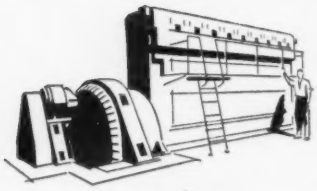
- CRANKSHAFT VIBRATION DAMPERS
- AUTOMATIC SHAFT SEALS
- PUMPS FOR AUTOMATIC TRANSMISSIONS AND POWER STEERING

SCHWITZER-CUMMINS COMPANY
1125 MASSACHUSETTS AVENUE
INDIANAPOLIS 7, INDIANA, U.S.A.



"Cured... bearing failure in their diesel-driven, front-end loaders"

A large fire-brick manufacturing company in the Philadelphia area had the problem of premature bearing failure in its diesel-driven loaders and shovel.

Headlights on even in daylight...

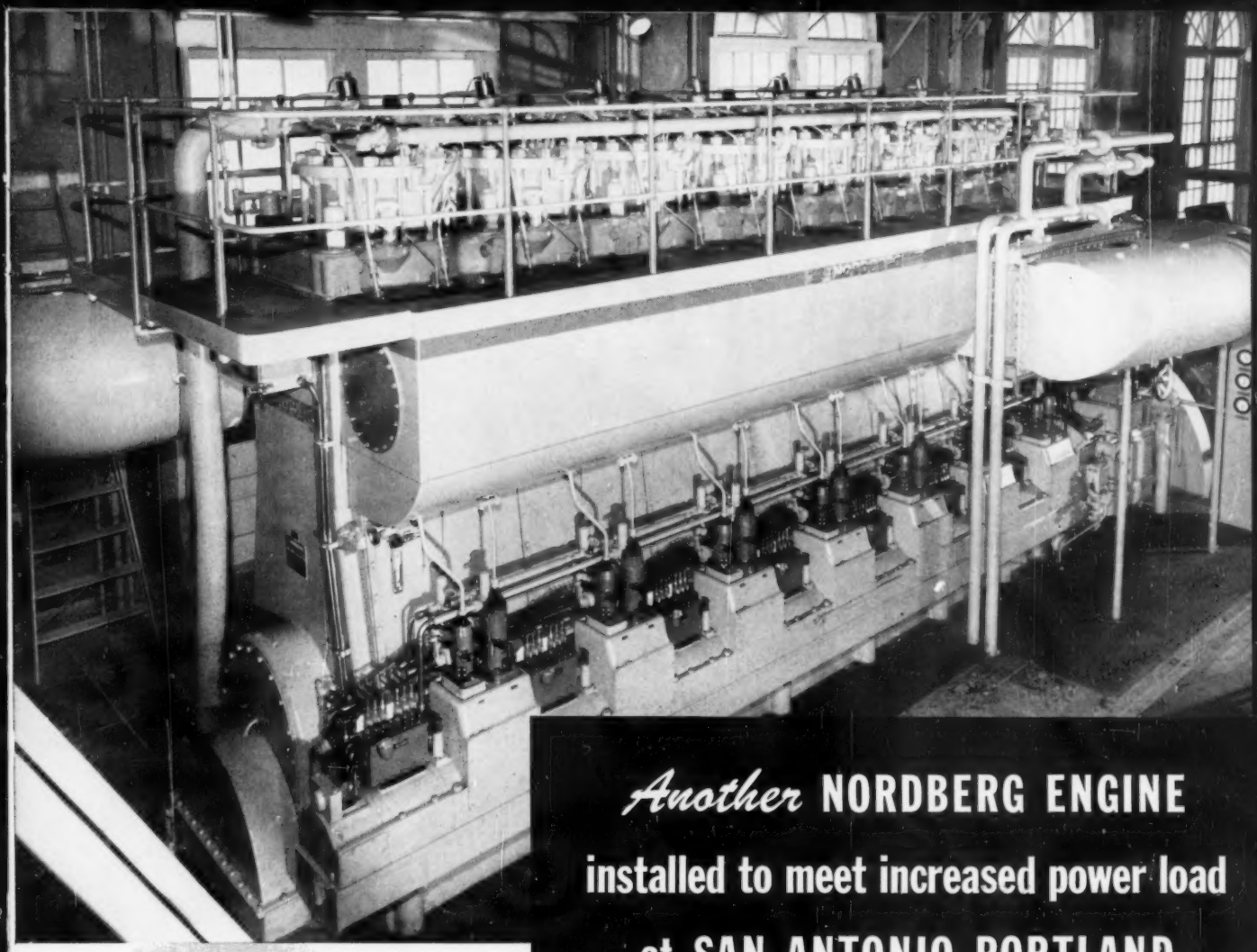
Sinclair Lubrication Engineer Harry Donovan reports, "These units were operating around the clock under conditions *so dusty that headlights were required.* Crankcases had to be drained and flushed bi-weekly! My first recommendation was closer adherence to an air filter maintenance program."

Drain intervals doubled!

Mr. Donovan continues, "Further observation proved to me that excessive idling and overloading were all contributing factors to a severe sludge condition. I recommended Sinclair SUPER TENOL® – explaining that the superior quality of the base oil plus the Sinclair formulated additives would extend bearing life *while at the same time removing accumulated lacquer and sludge.* A trial period proved SUPER TENOL doubled drain intervals and eliminated flushing entirely. This company now uses Sinclair SUPER TENOL exclusively."

Why not give a Sinclair Lubrication Engineer the chance to solve *your* lubrication problems? *There's no obligation.* Contact your local Sinclair office or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR LUBRICANTS



Another NORDBERG ENGINE installed to meet increased power load at SAN ANTONIO PORTLAND CEMENT COMPANY

SAN ANTONIO PORTLAND CEMENT COMPANY, one of the pioneer producers in the cement industry, has an enviable reputation for its efficient operation and quality product. Knowing that low cost power means lower cost cement production, this progressive company has long depended upon Diesel generating units as the main source of processing power for their Cementville, Texas plant.

The first Nordberg engine, a 3600 hp, 2500 kw gas burning unit, was installed in the San Antonio plant in 1948. In 1953, when additional capacity was required, another large Nordberg gas burning engine was installed—a 3010 hp, 2100 kw unit.

It is interesting to note that while this plant has a total of eight Diesel generating units, the two Nordberg engines represent over half of the total installed horsepower and carry 75% of the total load.

This is one more example of the way Nordberg Engines are being used to provide dependable, low cost industrial power. Next time you have a power problem think of Nordberg . . . builders of America's largest line of heavy duty engines, from 10 to over 10,000 horsepower.

NORDBERG MFG. CO., Milwaukee, Wisconsin

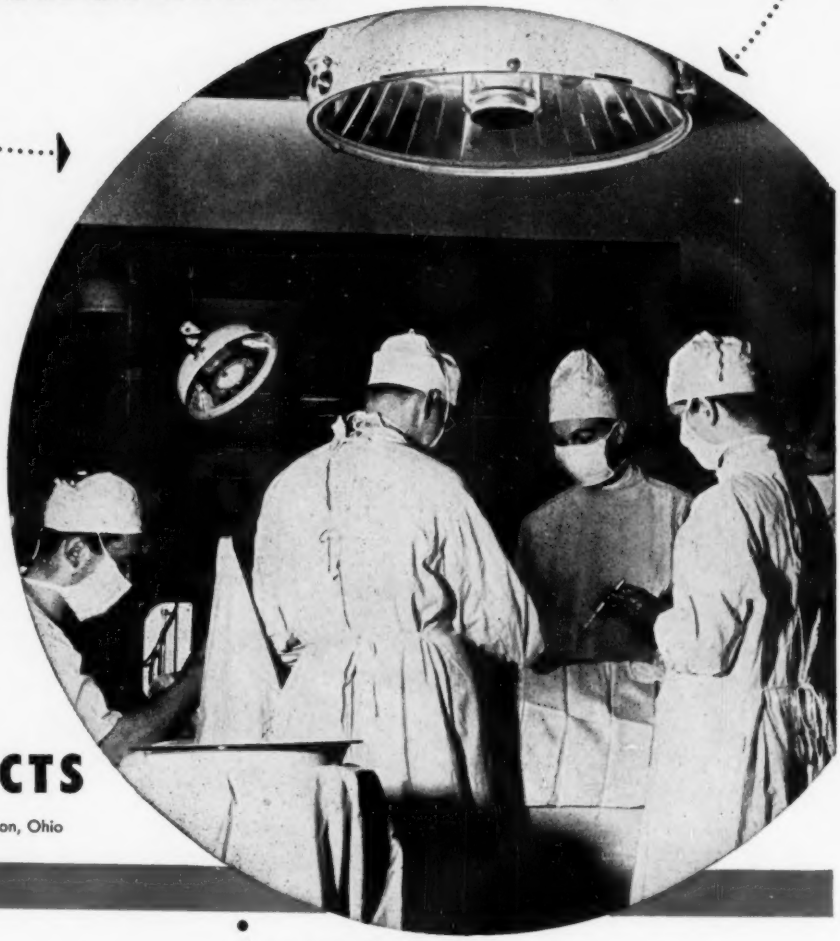
NORDBERG

DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

P454

For stand-by power

Delco Generators



Delco generators are designed to serve Diesel power plants effectively . . . and without fail. With a power range of 20 kw through 200 kw, AC and DC, 1200, 1500, and 1800 rpm, Delco generators have kept pace with Diesel engineering.

Hospitals, schools, public buildings, carnivals, circuses and outside construction jobs frequently call for power from an independent source. At such times Delco generators, time and again, prove their dependability for stand-by or portable service. Any of the sales offices listed below will be glad to supply detailed information.

DELCO DAYTON OHIO

DELCO PRODUCTS

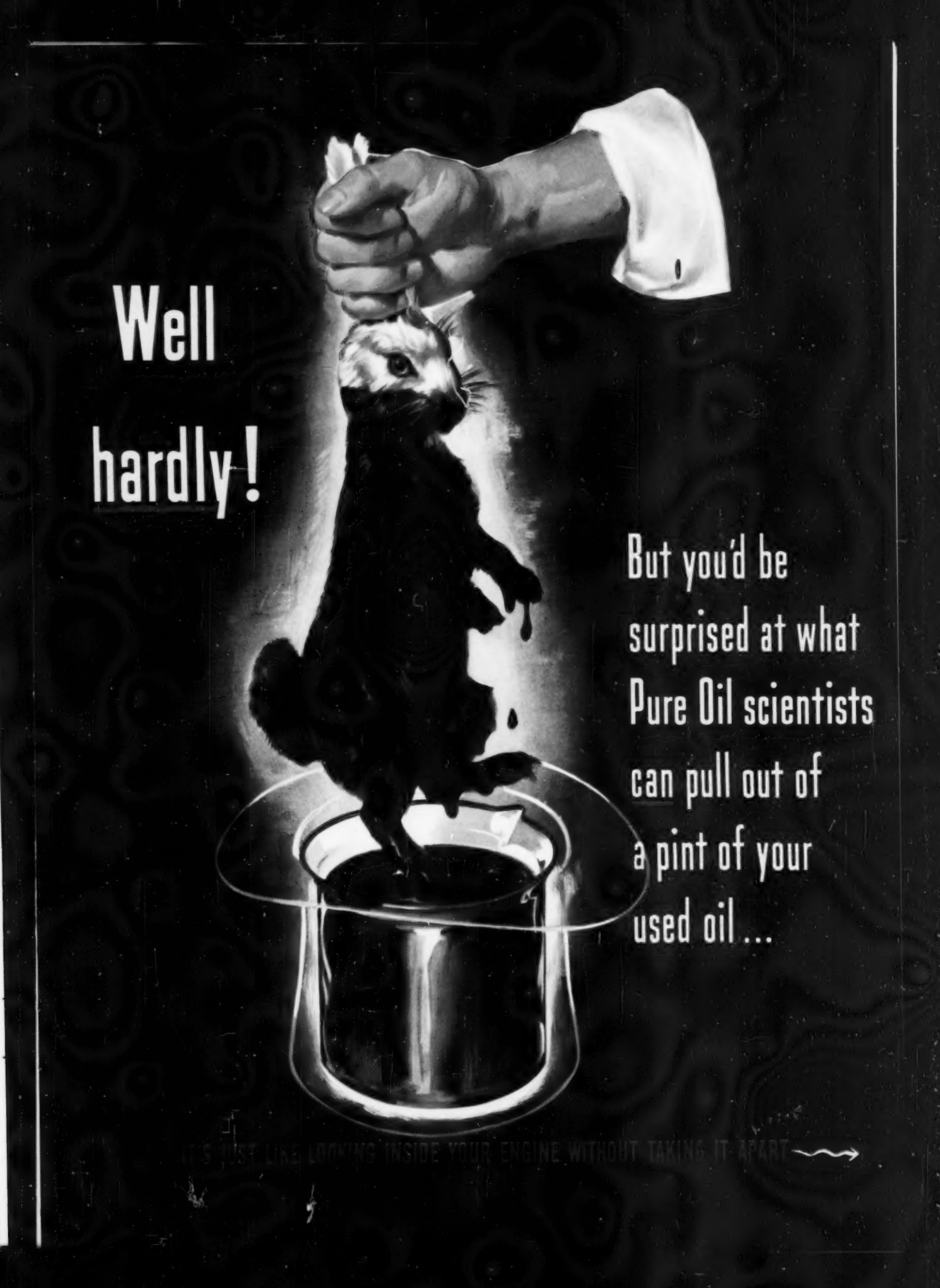
Division of General Motors Corporation, Dayton, Ohio

AC GENERATORS
20 kw through 150 kw at 1200 rpm
20 kw through 200 kw at 1800 rpm

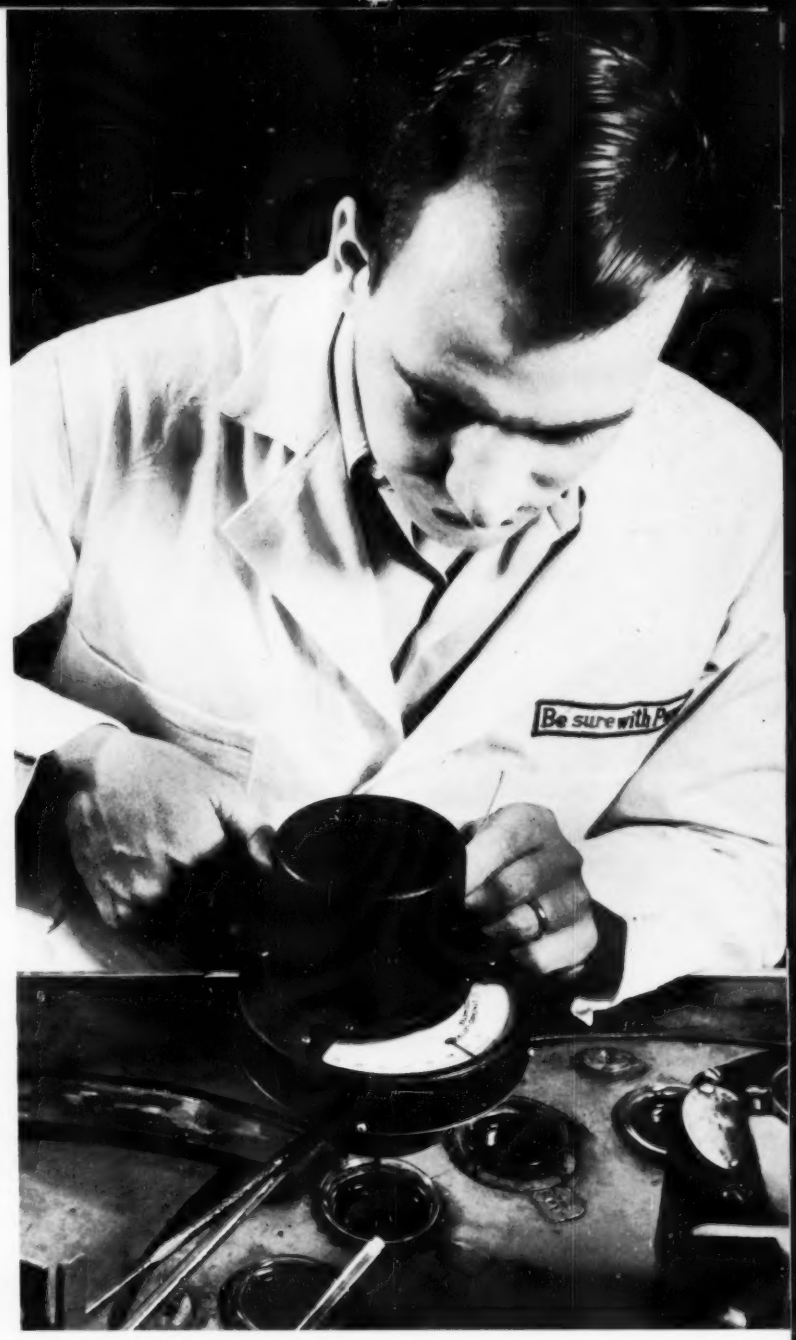
DC GENERATORS
20 kw through 90 kw at 1800 rpm
20 kw through 75 kw at 1500 rpm
20 kw through 60 kw at 1200 rpm

SALES OFFICES:

ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • EVANSVILLE • HARTFORD • KANSAS CITY • LOS ANGELES • PHILADELPHIA • ST. LOUIS • SAN FRANCISCO • SYRACUSE


Well hardly!
But you'd be surprised at what Pure Oil scientists can pull out of a pint of your used oil...
IT'S JUST LIKE LOOKING INSIDE YOUR ENGINE WITHOUT TAKING IT APART

Free Pure-sure used oil analysis forestalls engine repairs



...SAVES REPAIR BILLS AND DOWNTIME...CUTS OPERATING COSTS AND INCREASES EFFICIENCY

Pure Oil scientists aren't magicians, but you'll think they are when you see what they can pull out of a pint of used oil.

Without even seeing your engine, they can tell you if all is well... and if not, what's causing the trouble, and best of all —what to do about it *now*.

But why not let us *show* you how valuable a Pure-sure Used Oil Analysis can be? No charge. No obligation. We just want you to see the kind of service that's available to all Pure Oil customers all the time. Mail the coupon and see.

TRY IT FREE! MAIL COUPON NOW!

(Offer limited to 24-state area where Pure Oil products are sold)

THE PURE OIL COMPANY
Dept. CCJ-4
35 East Wacker Drive
Chicago 1, Illinois

Sales offices located in more than 500 cities in Pure's marketing area.

SURE—I'll try it! Send me information on how to obtain a Pure-sure Used Oil Analysis without cost or obligation.

Name_____

Title_____

Company_____

Address_____

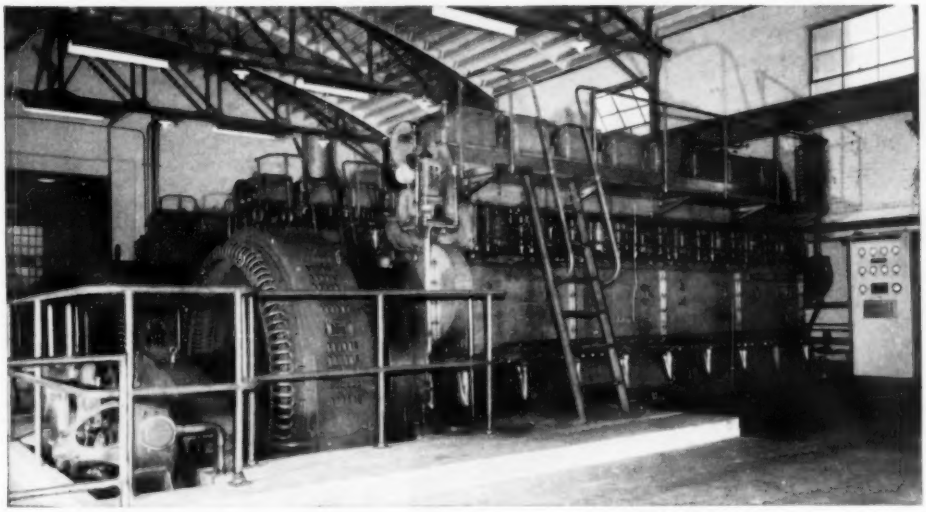
City_____ State_____

THE PURE OIL
PURE
COMPANY, U.S.A.

Be sure with Pure

Fuel oil savings, 50% longer service ...thanks to Koppers Piston Rings

... Koppers Piston Rings, Municipal Power Plant, Tarboro, N.C.



Koppers Porous Chrome* Rings. Porous chrome surface holds and distributes oil during break-in. Seats quickly. This chrome prevents grit from embedding in ring surface. Prevents cylinder wall scratching. Reduces wear 50%. Last 4 times longer than other rings.

Here's proof *that installation of Koppers Piston Rings can save on fuel, lubricating oil, labor costs.*

In conducting routine maintenance operations of the Municipal Power Plant, Tarboro, N. C., it was decided to install a new type of American Hammered Piston Ring.

Tarboro now uses #5 fuel oil (for which diesel was originally designed.) *Result: Tremendous Savings in fuel costs.*

In addition, compression has been increased . . . lubrication oil consumption decreased 200%-300%. And thanks to Koppers Piston Rings, cylinder wear has been less than .010 inches after 15 months of operation even under difficult working conditions. Think what that means in longer service, less down-time, lower labor costs.

There are many cases in which the installation of Koppers Piston Rings has proved helpful in getting economical engine performance. Does this suggest savings in operating and replacement costs to you? Then remember Koppers Piston Rings next time you have a diesel overhaul. First thing, investigate Koppers Conformable and Porous Chrome* Rings. And for special assistance with your specific piston ring problems, consult our technical staff.

Koppers Conformable Ring maintains constant unit pressure for positive oil control. Conforms readily to meet cylinder distortion because flexible cast iron member is pressed outward by abutment type spring which exerts uniform radial pressure around entire circumference.

*Van der Horst Process

KOPPERS®

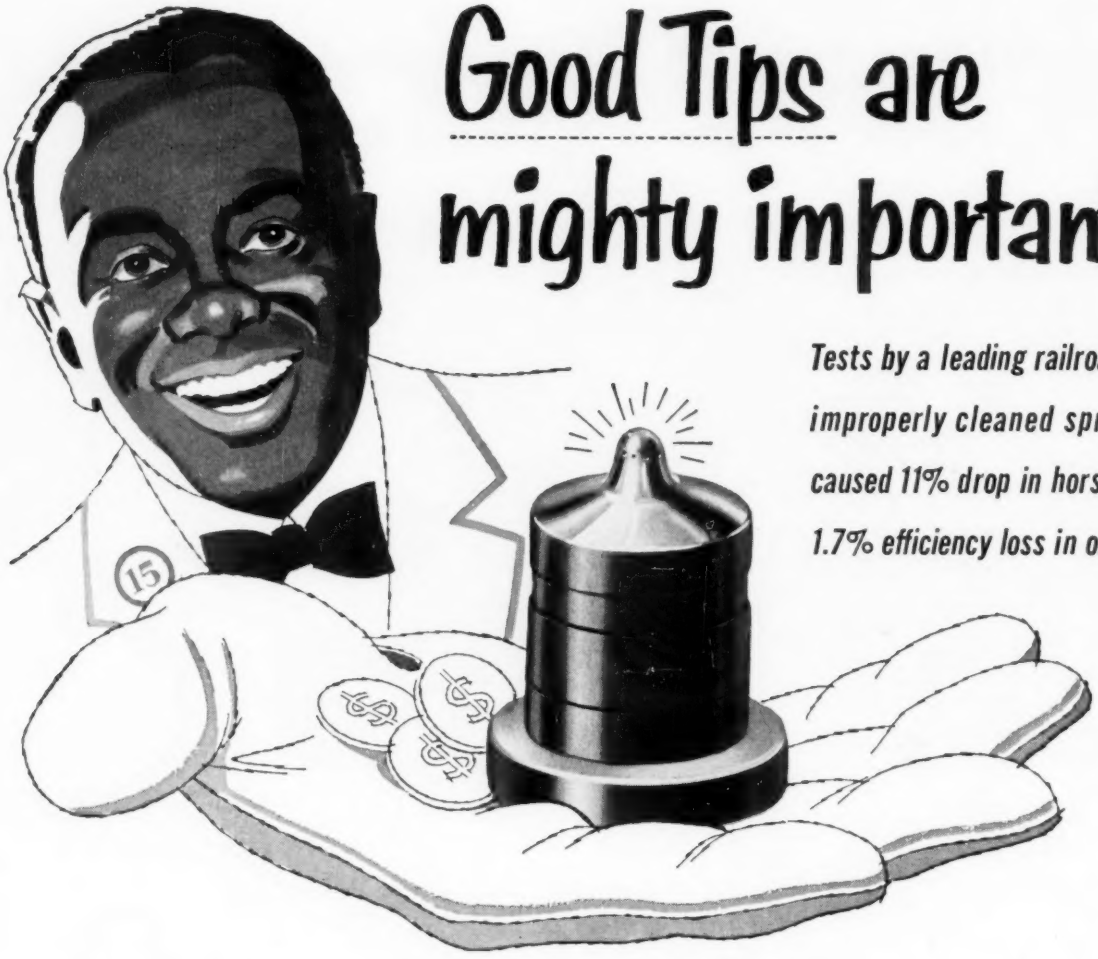
AMERICAN HAMMERED
Industrial Piston Rings

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC. • Baltimore, Maryland
This Koppers Division also supplies industry with Fast's Couplings, Aeromaster Fans, Koppers Electrostatic Precipitators and Gas Apparatus.
Engineered Products Sold with Service

KOPPERS COMPANY, INC., *Piston Ring Dept.*, 1641 Hamburg Street, Baltimore 3, Md.
Gentlemen: Please send me full information on your Conformable Oil Ring.

Name .....
Company .....
Address .....
City ..... Zone ..... State .....

Good Tips are mighty important!



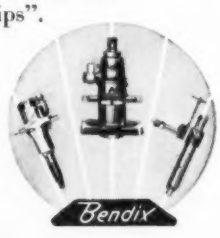
Tests by a leading railroad show improperly cleaned spray tips caused 11% drop in horsepower, 1.7% efficiency loss in one year.

Proper maintenance of equipment is a major problem for any railroad, and much time, effort and money are expended to keep power plants functioning at peak efficiency.

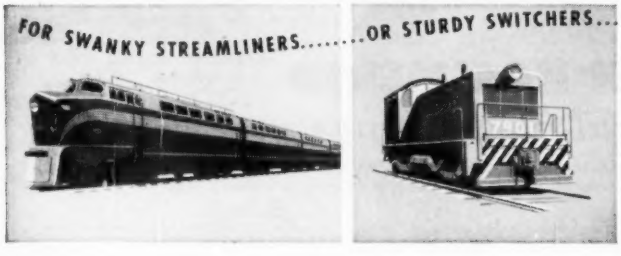
Even the smallest type of equipment such as the spray tips on your fuel injection equipment can cause serious efficiency losses unless properly maintained, as evidenced by recent tests made by one of America's leading railroads.

To assure that operators get full performance out of Bendix Fuel Injection Equipment, we have prepared a special folder showing the best proven method of maintaining the original high polish on spray tips in order to reduce carbon deposits to a minimum.

Send today for your copy of the Bendix bulletin, "How To Clean Spray Tips".



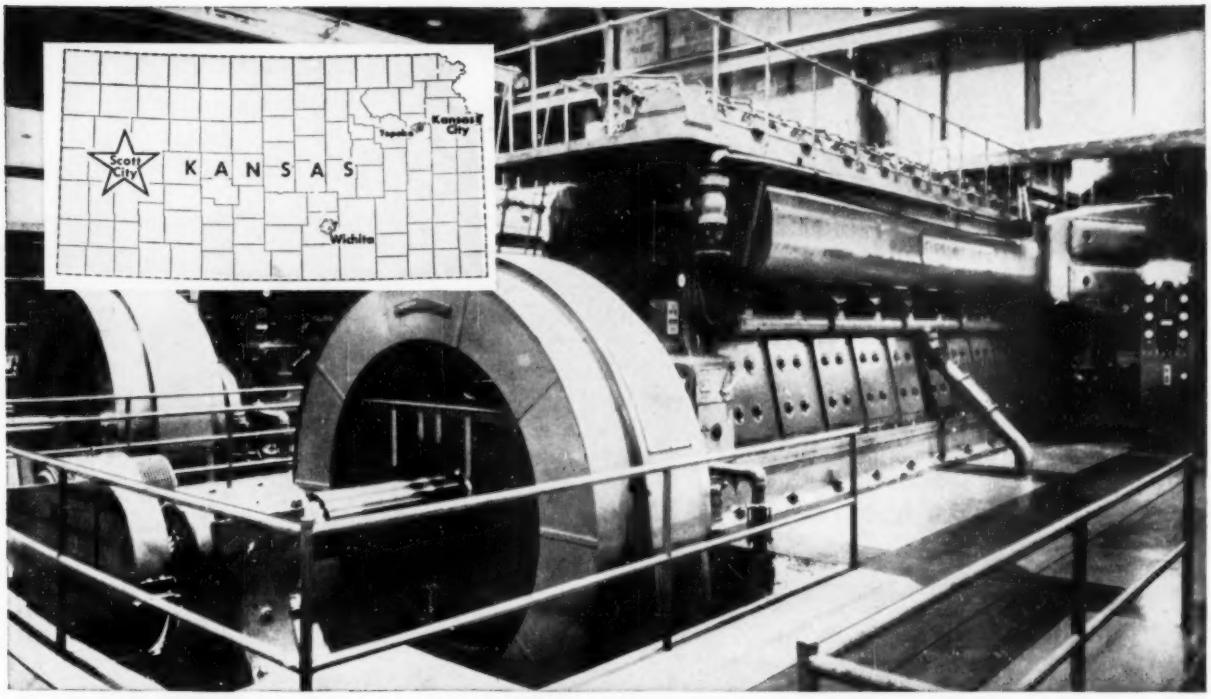
SCINTILLA DIVISION OF Bendix AVIATION CORPORATION
SIDNEY, NEW YORK



BENDIX*
FUEL INJECTION EQUIPMENT

*REG. U.S. PAT. OFF.

Western Office: 582 Market Street, San Francisco 4, California
Export Sales: Bendix International Division of Bendix Aviation Corporation
205 East 42nd Street, New York 17, N. Y.

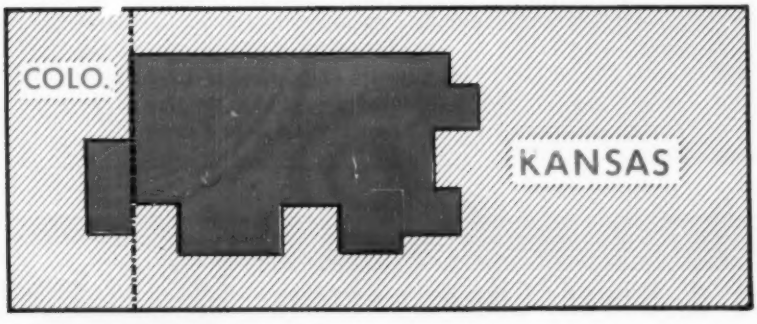


Largest REA Plant in Kansas Reports Cities Service DC-840 Diesel Oil Excellent!

Fairbanks-Morse Diesels of Wheatland Electric Cooperative, Inc. give outstanding performance using DC-840 Oil for power cylinder and crankcase lubrication. Here are the results Wheatland achieved:

1. House operation each unit—13,000 hours.
2. No oil changes due to oil failure.
3. No overhaul or major breakdown.
4. Rings free in groove with little or no signs of wear.
5. Oil consumption within mfgr's. recommendation.
6. Fuel consumption 10,572 BTU/KWH, load factor 63.7%.
7. Maintenance of lubricating oil at minimum expense.
8. 3500 H.P. hours per gallon of lubricating oil.
9. No wear on main or rod bearings.
10. No oil change at end of 9,000 hours.

For similar results in your Diesel operation, contact your nearest Cities Service office or write to Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



WHEATLAND ELECTRIC COOPERATIVE, INC. serves 3,300 square miles in all or part of Scott, Wichita, Hamilton, Greeley, Kearny, Wallace, Logan and Finney Counties in Kansas as well as sections of Kiowa and Prowers Counties in neighboring Colorado. Also supplies wholesale the Lane-Scott Cooperative serving 2,200 square miles in 6 Kansas Counties.

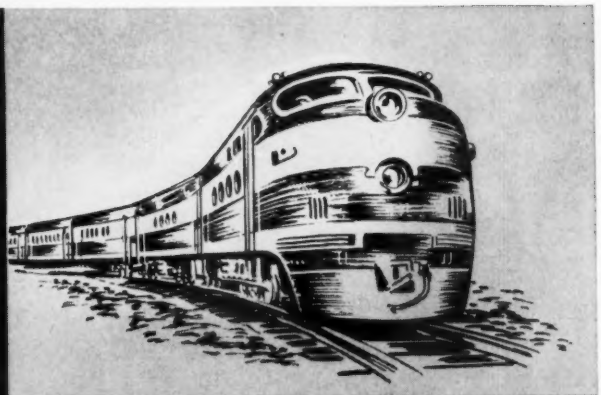
CITIES SERVICE

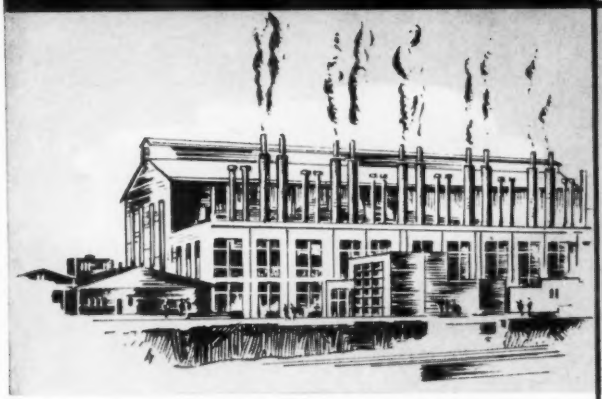
QUALITY PETROLEUM PRODUCTS

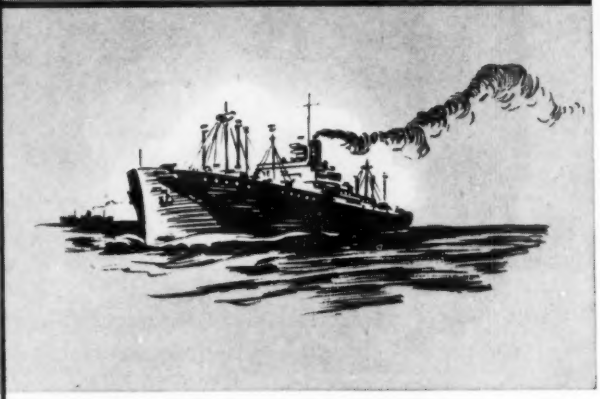
Dependable

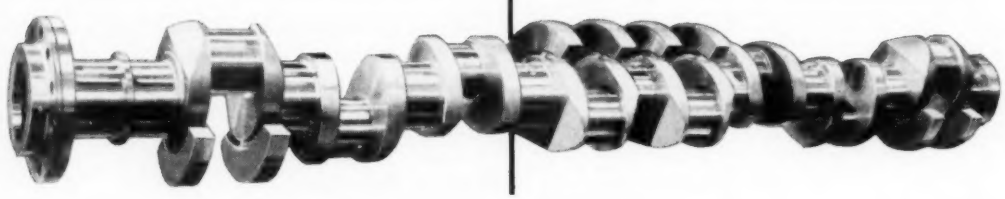
Transmission of Power . . .

ERIE FORGE Diesel Crankshafts!



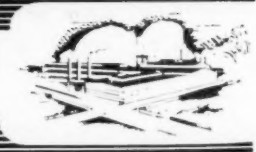




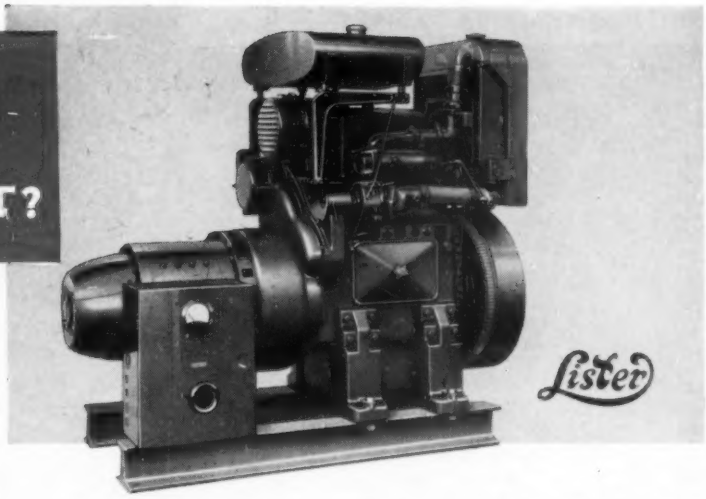


Here's the "Giant in the Diesel" . . . transmitting power that drives the modern railroad engines, pushes huge ships speedily and surely through the waves, or runs the power plants of business and industry. Erie Forge crankshafts are produced — from pouring of ingot to finished product — in our own plant. Every step is under the complete control of experienced craftsmen . . . one control, one responsibility. At Erie Forge you get the full benefit of our know-how and experience in the production of highest quality crankshafts — of exactly the right material to meet the most rigid requirements. Consult with Erie Forge on your next shafting requirements.

ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA



NEED A FUEL-SAVING ELECTRIC PLANT?

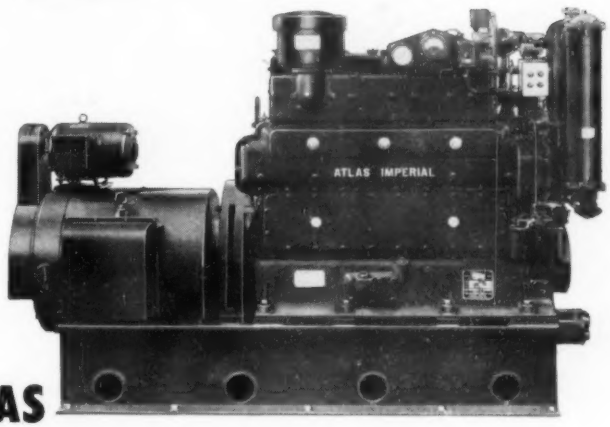


Then you'll certainly want all of the facts on the diesel engines that have consistently provided dependable power for generator operation *at the lowest fuel cost per kilowatt hour!*

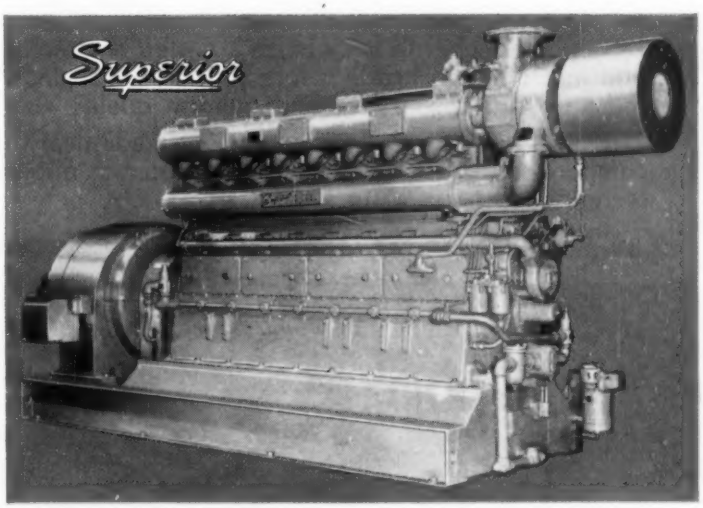
These famous Superior, Atlas and Lister Diesels are widely used for generator power in municipal light plants, water works, sewage plants . . . for standby power in countless industrial operations . . . and for both propulsion and auxiliary power throughout the marine field.

Performance and operating records from hundreds of these installations prove the exceptional economy of National Supply Diesel engines in service. This reputation, plus efficient 4-cycle design and rugged construction, make Superior Atlas or Lister Diesels your best engine investment for power generation.

These National Supply engines are available in a complete range of horsepower ratings to suit virtually every output need (check chart below). For complete information, write or call the nearest sales or service point.



ATLAS



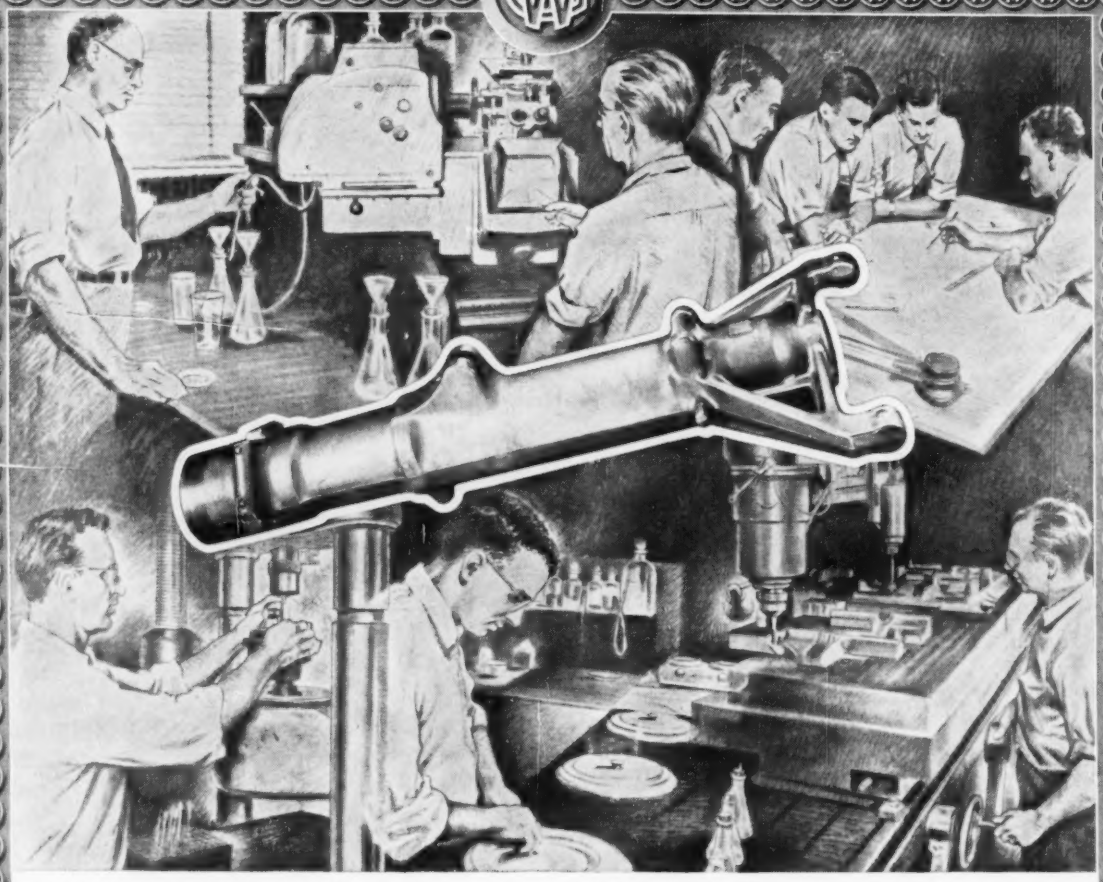
Engine Model	Recommeded Generator Capacities
LISTER FR 1	3— 5 KW
LISTER FR 2	10—12 KW
LISTER FR 3	15—18 KW
LISTER FR 4	20—24 KW
LISTER FR 6	30—35 KW
ATLAS Model 35	100 KW to 200 KW
ATLAS Model 45	100 KW to 400 KW
SUPERIOR Model 40	155 KW to 500 KW
SUPERIOR Model 60	280 KW to 645 KW
SUPERIOR Model 65	420 KW to 1250 KW
SUPERIOR Model 80	450 KW to 1000 KW

DIESEL DUAL FUEL GAS — THE NATIONAL SUPPLY COMPANY — ATLAS Imperial DIESEL ENGINES — Superior ENGINES — DISTRIBUTOR OF Lister DIESELS IN U.S.A.

THE NATIONAL SUPPLY COMPANY

ENGINE DIVISION PLANT AND GENERAL OFFICES: SPRINGFIELD, OHIO

SALES AND SERVICE POINTS: Gloucester, Massachusetts • Houston, Texas • Fort Worth, Texas • San Diego, California Oakland, California • Terminal Island, California • Ketchikan, Alaska • Washington, D.C. • Chicago, Illinois • Portland, Oregon • Astoria, Oregon • Casper, Wyoming • St. Louis, Missouri • Halifax, Nova Scotia • Vancouver, B. C. • Park Rapids, Minnesota • New York, New York • Seattle, Washington • New Orleans, Louisiana • Pittsburgh, Pennsylvania



FORGING TECHNICIANS—Yes, that is the compliment paid us by those acquainted with our services. In back of each design is a thorough understanding of engineering and metallurgical needs before production begins . . . assuring forgings of maximum physical properties and uniform quality

THE LANDING GEAR FORGING illustrated, nearly five feet long, is an important component for a modern military fighter . . . another example of Wyman-Gordon's technical contribution to aircraft.

There is no substitute for Wyman-Gordon experience

WYMAN-GORDON

Established 1883

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

WORCESTER, MASSACHUSETTS

HARVEY, ILLINOIS DETROIT, MICHIGAN

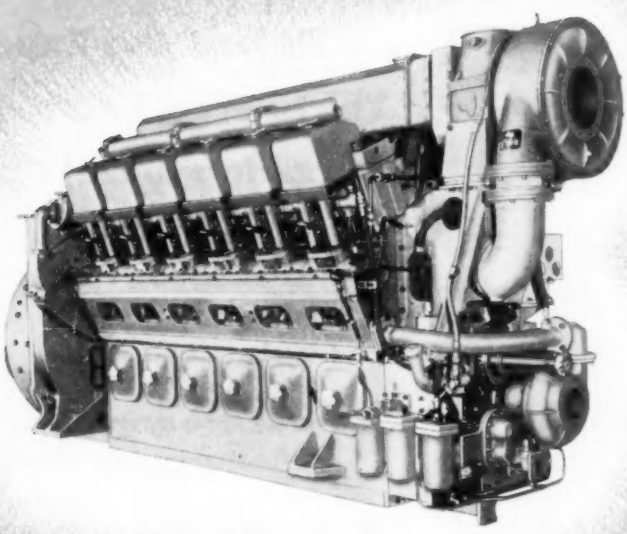
SPECIFICATIONS

Sizes: 12- or 16-cylinder • Bore: 9" • Stroke: 10½"
Cycles: 4, turbocharged
Horsepower: from 1100 at 720 rpm to 2040 at 1000 rpm
Net weights (engine only):
12-cylinder: 31,365 lb dry, 32,965 lb wet
16-cylinder: 37,000 lb dry, 38,996 lb wet

TYPICAL APPLICATIONS

Crude Oil Pipeline Pumping
Products Pipeline Pumping
Electric Power Generation
Irrigation Pumping
Dredging
Portable Units Mounted on Skids

the ALCO heavy-duty, lightweight



9" x 10½" engine for continuous or stand-by service in stationary or portable installations!

Here's the diesel engine you've been waiting for—the latest addition to a line long famous in every quarter of the globe.

It's the heavy-duty, lightweight 9" x 10½" ALCO . . . a single source of low-cost, dependable power for a wide range of applications—continuous or stand-by, stationary or portable.

Look at the partial list of specifications, applications and special features above and at right. See if you don't agree that the all-purpose Alco is the answer to your toughest, costliest diesel-engine problems.

For more information fill out and mail attached coupon. We'll send you promptly a free copy of our Bulletin DE-4, giving complete details.

SPECIAL FEATURES

Engine base and frame of structural steel—for light weight, greater strength, more economical foundations.

Compact design—saves floor space.

All wearing parts easily accessible for maintenance.

Lube-oil sump, circulating-water pump, and lube-oil pump are integral parts of engine—thus reducing installation costs.

Air-motor engine starting, using as low as 60 lb air.

Turning gear—built into engine for use with commercial air motor.

Free end of engine has extension shaft for driving auxiliaries (fan compressor, etc.).

ALCO DIESELS

AMERICAN LOCOMOTIVE COMPANY

Sales and Service Offices in Principal Cities

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

Gentlemen:
Please send me a copy of your Bulletin DE-4 giving complete details on the heavy-duty, lightweight ALCO diesel engine.

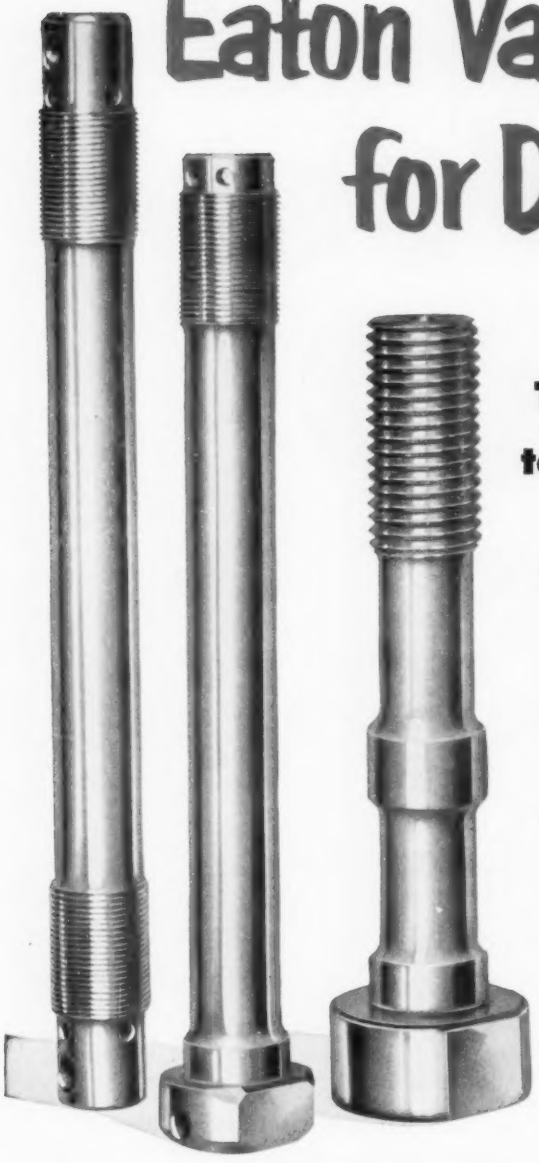
Name_____

Company_____

Street_____

City_____ Zone____ State_____

Eaton Valves and Bolts for Diesel Engines



Reflect the Experience of Thirty-Five Years as a Supplier to Leading Diesel Engine Builders

- **Years of forging experience, plus the most modern forging equipment**
- **Heat treatments under strict metallurgical control**
- **Highly specialized precision production facilities**
- **Rigid adherence to customer specifications**

EATON

EATON MANUFACTURING COMPANY

General Offices: CLEVELAND, OHIO

VALVE DIVISION: 9771 FRENCH ROAD · DETROIT 13, MICHIGAN

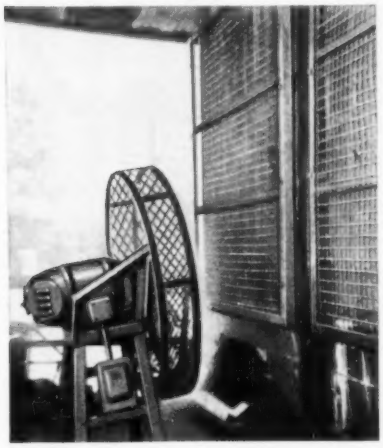
PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

"You can't 'fan away' cooling system trouble"

says Joe Vettel

Manager—Perry Filter Division
R. M. Hollingshead Corporation

The unusual set-up you see just below was found on a drilling rig in the southwest—an 18-inch electric fan to push air through the radiator cores in an effort to accomplish fast heat dissipation. Obviously, the whole cooling system was not clean enough to function with proper efficiency.



There's trouble ahead

This set-up is so typical that I got a picture of it purposely as a fine example of one of the greatest single factors affecting engine life and operating costs—the lack of a *constantly* clean cooling system. A cooling system must be clean *all the time* or your maintenance department will soon become a repair department.

Cooling system trouble is of two kinds (both of which can be prevented): 1, that caused by deposits of water scale, rust, grease, oil and other foreign matter; and 2, that caused by corrosion, the actual chemical and electro-chemical destruction of metals in the system. Both cause build-up of insulation materials in critical heat transfer zones and in a very large measure are responsible for premature overhauls from worn pistons, rings and liners, or from distorted valves and seats, cracked blocks and heads.

This avoidable cooling system trouble can be an expensive proposition. First of all, there's the labor and material costs of removing and rodding the radiator, plus the hidden, and often uncounted, cost of lost production time when the engine is down. This can all add up to a substantial sum.

This operator with a fan in front of his radiators is a victim of "hit-or-miss" cooling system cleaning. Obviously from what you have read previously in this article a cooling system conditioner must do two jobs for complete protection . . . and this is where the Perry Cooling System Filter and Conditioner comes in.

This small, patented unit combines proved methods of chemical treatment and inhibition, electro-chemical protection and mechanical filtration. It's a *replacement* element type filter and conditioner that is easily and permanently attached to the engine and which works much like an oil filter. The Perry Cooling System Filter and Conditioner is known to and is being used by hundreds of gasoline and diesel powered engine operators all over the country.

Typical installation on diesel engine

WE GUARANTEE THIS: Correctly installed on any new engine, and properly serviced, the Perry Filter and Conditioner will keep the cooling system clean and eliminate a major cause of costly breakdown; on old engines, the Perry Filter will gradually clean the system and reduce the cost of upkeep.

Its cost on a gas or diesel powered industrial engine is actually less than half the cost of one radiator cleaning or rodding job . . . and is substantially less than any major engine repair resulting from lack of cooling system protection.

Easily installed, effective Perry Filter

For the full story on the Perry Filter, fill out the coupon below and send it on to me. I'll personally see that you get a prompt reply on how this remarkable piece of equipment can save you headaches and money.

Joe Vettel

Perry COOLING SYSTEM filter and CONDITIONER

PATENT PENDING ®

SEND TODAY

Mr. Joe Vettel
Perry Filter Division
R. M. Hollingshead Corporation
843 Cooper Street
Camden 2, New Jersey

Please send me the full information on the Perry Cooling System and Conditioner.

Name_____

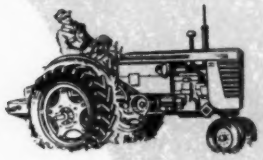
Firm_____ Position_____

Address_____

City_____ Zone____ State_____

THIS PUMP OPENED NEW DIESEL MARKETS...

THE AMERICAN BOSCH "PSB"

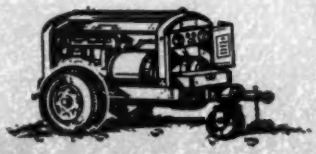


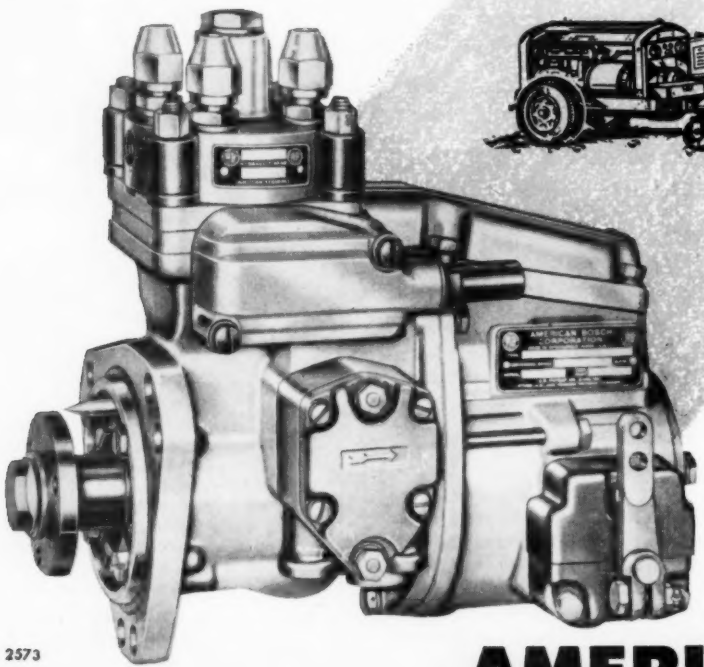
American Bosch's development of the PSB single-plunger pump made it possible for engine manufacturers to produce the smaller, lower-cost Diesels which have opened up new markets for Diesel power. You see it serving everywhere —on efficient Diesels that power farm tractors, compressors, generating sets, boats and trucks in ever-increasing numbers.

Today, more Diesel engine manufacturers are using the American Bosch PSB as standard equipment than ever before. It's easy to see why —for the PSB gives both the engine manufacturer and the user a simplified, compact, lower-cost pump with a *proven* record of outstanding performance and dependability *plus* ease of servicing and low maintenance expense.

The PSB is a product of American Bosch's continuing program of research and development. It stands as a significant contribution to the progress of the Diesel.

AMERICAN BOSCH, Springfield 7, Mass.





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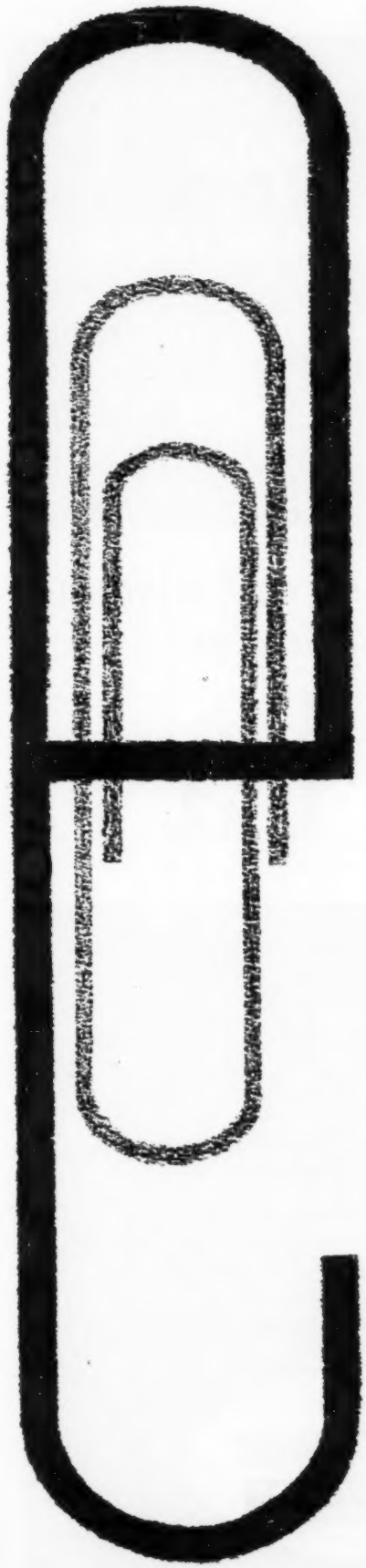
AMERICAN BOSCH



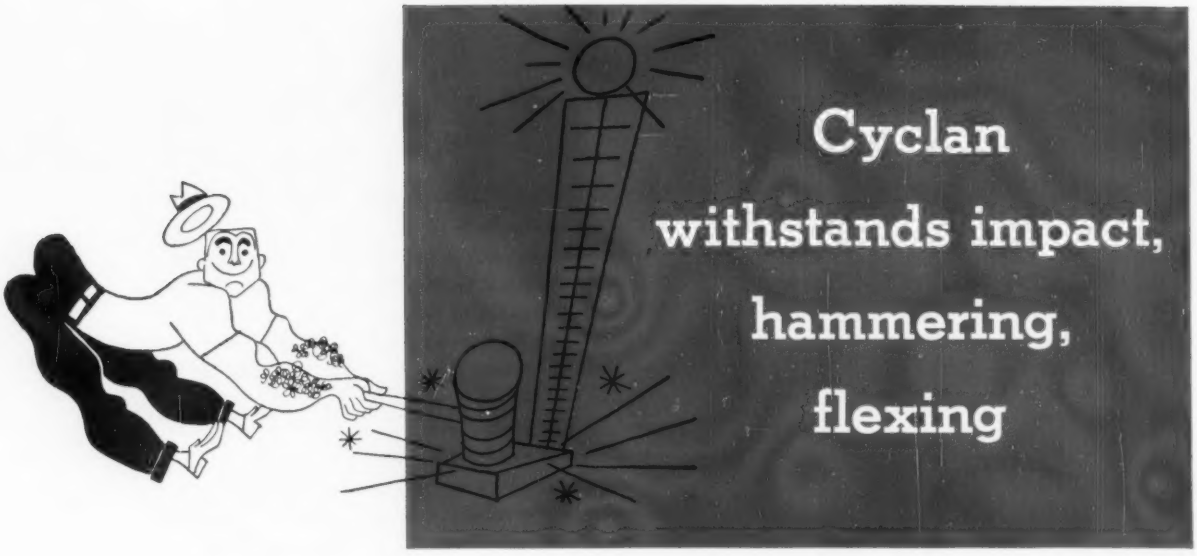
Putting Bunker Fuels in Perspective

We have reported on the subject of burning bunker fuels and other heavy fuels over a long period of time. Our reason has been a belief that in certain fields diesels would have to resort to this potential economy to stave off inroads of competitive forms of power that can burn the lower-cost fuels. Plants going to heavy fuels and the recent trend for bid specifications to include that the engines be capable of burning residual fuels seem to justify our course. All this proves is one thing—the economic incentive is there.

Technical aspects are a different matter. We have tried to deal with the subject objectively, and to get matters straight let us say here and now that we still don't know how to burn heavy fuels. We *do* know how to burn *some* heavy fuels—in *some* engines—in *some* services. Our reporting is not intended to give *the* answer but rather to give *one* answer. In short, someone has learned to live with the problems under the conditions

ditorially speaking

specified. By correlating all the data available we hope to round up field experience to see if a pattern will emerge. One thing has emerged—trouble—and sometimes the kind of trouble that makes candidates for Alcoholics Anonymous. Our hat is off to those pioneers who stuck with it to achieve some economic success. There is a lot of work being done and the "heel-dragging" days are pretty much over; economic pressures are too great. No one in his right mind wants to burn heavy fuels. But he may have to. Many sections of our industry are working hard on the problem and it is a safe bet that some answers will develop. We'll know what it is all about some day. Until then, we want to emphasize that you don't just burn heavy fuel; you have to "live" with it. Since the economic pressures just won't go away, the engine's appetite will be made more cosmopolitan and a cheap diet more palatable. We'll keep you posted.



No other piston ring material combines so many advantages as

Cyclan

- Cyclan is Sealed Power's new alloy for extreme operating conditions.
- Cyclan's strength approaches that of steel.
- Cyclan's resilience exceeds that of cast iron.
- Cyclan retains the bearing characteristics of cast iron.
- Cyclan has extra high impact value for resisting shock.
- Cyclan rings retain their true shape even after considerable deflection.
- Cyclan piston rings are especially durable in super-charged engines.
- Cyclan can be readily chrome-plated, but functions efficiently without plating.
- Cyclan is available for original equipment rings in heavy duty engines.
- Some Sealed Power Cyclan Ring Sets are available for replacement use now. Others will follow soon.

Let our engineers tell you the Cyclan story!

SEALED POWER CORPORATION, MUSKEGON, MICHIGAN

Sealed Power

PISTON RINGS · PISTONS
CYLINDER SLEEVES

highlights

■ American Soc. of Mechanical Engineers will hold its annual meeting in New York City at the Statler Hotel from Nov. 28 to Dec. 3, 1954.

■ "Hot Potatoes" — Brookhaven National Laboratory biologists report that potato storage can be prolonged by exposure to nuclear radiation.

■ It was recently reported by *American Aviation Magazine* that the Russians may be turning to diesel-powered aircraft to achieve the long-range which the U.S. has obtained by aerial refueling.

■ It was recently reported by the Armour Research Foundation that the Missouri Pacific has installed a spectrograph at its central test laboratory for analysis of lube oil samples taken from the crankcases of its diesel-electric locomotives.

■ Canadian Locomotive Co. has an encouraging backlog of orders for diesel engines for railroad, marine, and industrial service. The firm is currently reported to be working on a $5 million diesel order for Canadian railroads.

■ According to the *Co-Operator*, the LeTourneau - Westinghouse mobile training unit which has travelled all over the U.S. and Canada recently took a voyage to Cuba. The purpose here was to bring the owners and operators the latest information on maintenance and operational techniques. Two 8-day schools were conducted.

■ The Erie Railroad Magazine tells us "The organist at Grand Central Station in New York is forbidden to play 'The Star Spangled Banner'." The ban has been in effect since the day after the Pearl Harbor attack when the song was played during the rush hour, causing amazing confusion. Trains pulled out without their passengers who stood at attention. All activity was halted as the trains left while commuters watched helplessly.

■ Muncie, Ind. has selected three Model 69-CP Chicago-Pneumatic dual-fuel engines to power its new sewage treatment plant which is now under construction.

■ Only 10% of the buses manufactured in the U.S. during 1945 and 1946 were diesel powered. This is in contrast with 39% in 1952.

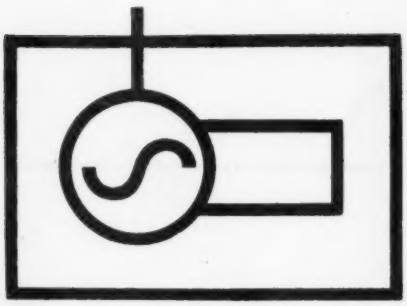
■ At the last accounting, there were 46 models of diesel-powered wheel and track-type tractors being offered to the farm market by some 15 manufacturers.

■ According to API, the government geologist who prophesied in 1919 that our oil reserves did not exceed 7 billion bbl, has missed it by 69 billion to date. And today, new oil reserves are found faster than oil is taken from the ground.

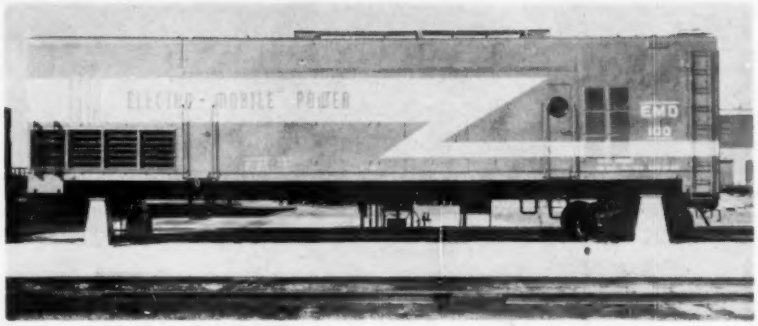
■ During the first eight months of 1954, Class I railroads installed 866 new diesel-electric locomotive units in service, as compared to 1550 units during the same period of 1953. Looks like full dieselization is approaching, at which time there will remain a replacement market which is not to be taken lightly.

■ AAR's research center in Chicago has one phase of its research program aimed at diesel fuels. If oil costing 1c less per gal can be burned, the railroad industry will be able to slice $30 million from its half-billion dollar annual fuel bill, according to AAR.

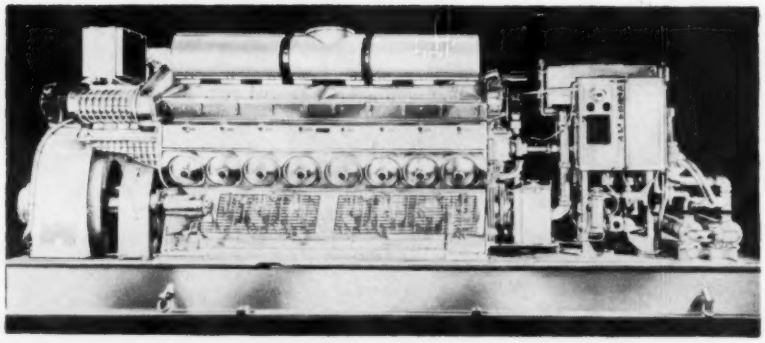
■ The final link in the series of super-highways connecting Chicago and New York was recently started when ground was broken for the northern Indiana toll road. Instead of using a shovel in the ground-breaking ceremony, the governors of Ohio and Indiana made the first cut with a Model HD-20 diesel-powered dozer. A fitting start to a job which will be done for the most part with diesel-powered equipment.



Electro-Mobile Power



Largest of the new line, symbolized above, is the 1000-kw rail-mounted unit. Pedestals illustrate semi-permanent installation.



Compactness of car's power package is shown in 1000-kw skid-mounted version. Units are also built in 350-, 500-, and 750-kw capacities.

Electro-Motive Division of General Motors demonstrates a new line of mobile and portable generating sets aimed directly at electrical public utility applications.

OFFICIALS from approximately 100 leading public utilities were present at the unveiling of Electro-Motive's new "power packages". Part of the demonstration was billed as the application of the power units in a "simulated" emergency. This came close to being the real thing since a few days before, the Chicago area was deluged with rain, causing severe flood damage including some curtailment of power.

EMD was just recovering from a complete shutdown and was operating at reduced capacity due to the shortage in the local power supply. Following the demonstration, available power generating sets went on the line supplementing the power supply with 3500 kw.

This new line of EMD products consisting of completely integrated diesel-electric generator sets—350- and 500-kw highway units and 750-, and 1000-kw rail-mounted units—was aimed directly at utility service. They can be more accurately described as mobile *and* portable units since they are also available on skid mounts for permanent or semi-permanent installation.

These generating sets are part of EMD's program to take up the slack caused by the decreasing demand of the railroads for locomotives as they approach total dieselization. The new program will not interfere with production of new units, and of course parts requirements alone will absorb a good portion of the facilities. In fact,

Mr. Dezendorf, GM vice president and EMD general manager, pointed out that for the last three years their customers and EMD's rebuilding facilities had used more parts than those required for new units.

It is pretty obvious that these new generating units can be produced with a minimum dislocation of existing facilities. Not only are the major components either identical or very similar in nature, but the concepts of locomotive design carry over as well. For example, both must be self-sufficient practically-automatic power plants, and both are subject to stringent weight and space limitations.

Further parallels can be drawn. For example, the present parts distribution system and rebuild facilities for locomotive engines are equally applicable for these units. And as with locomotives, since EMD builds all components, a single supply source is established. Responsibility is centralized too.

Application

There is nothing new about the idea of mobile and portable power sets even in the 1000-kw bracket. Some utilities are using similar units now. What *is* new is the concept and scope of the program and the low price per kilowatt of capacity that this permits.

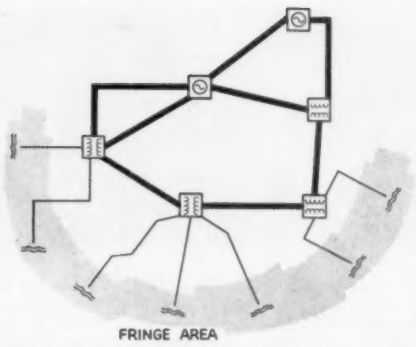
In a press conference, Mr. Dezendorf outlined EMD's thinking. Studies were made of utility operation to determine where and how such equipment could be utilized to advantage. Application engineering plays a large part. In a sense the market is being created. They plan to show the utilities how they can realize substantial benefits through use of this equipment.

Sales effort—right from the builder to user—will be directed at the utilities. Answering a question as to the availability of units to industry as prime or emergency power, Mr. Dezendorf indicated that they could be purchased but that EMD's policy would be to encourage utilities to buy the sets so that they could guarantee continuity of power in cases where power failure was a critical matter.

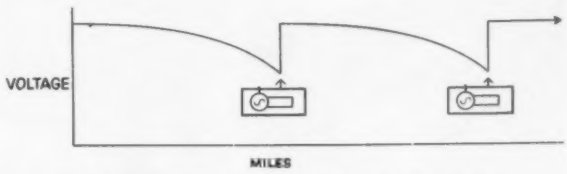
Now, just what are some of the uses for such units? First, keep in mind the expanding use of electricity per capita, growth of population, and the trend toward decentralization—both residental and commercial. The net result is a distribution problem with particular emphasis on fringe areas with their low load factor demands. Service in these areas, while necessary, is frequently uneconomic until load growth warrants extension of the major grid.

In fringe areas, availability of such units can postpone the expense of second lines while providing protection against disaster of any sort. They would also provide for temporary power requirements as might be needed for a large construction project, a carnival or exposition, or to maintain service during line or sub-station work.

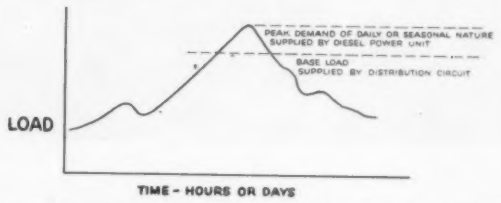
Daily, monthly, and seasonal load fluctuations in these areas are not uncommon. Major increases in central station capacity or distribution system capacity to meet



Basic distribution problem lies in the fringe areas.

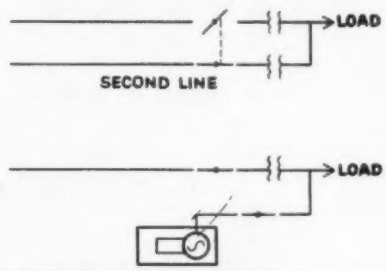


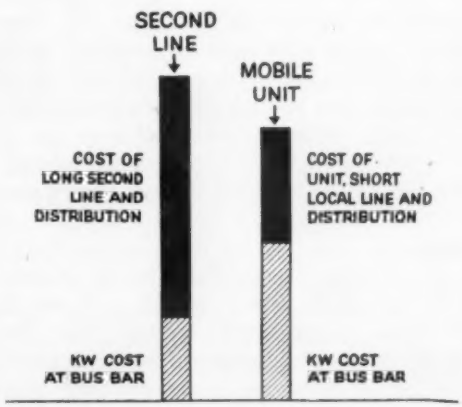
Line losses can be reduced by using booster stations.

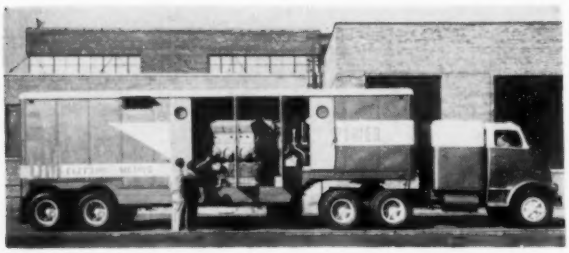

PEAK DEMAND OF DAILY OR SEASONAL NATURE SUPPLIED BY DIESEL POWER UNIT
BASE LOAD SUPPLIED BY DISTRIBUTION CIRCUIT
LOAD
TIME - HOURS OR DAYS

Peak skimming service is well suited for diesel capabilities.

One example of how overall cost of electrical service can be reduced by use of mobile diesel generating units.




SECOND LINE
MOBILE UNIT
COST OF LONG SECOND LINE AND DISTRIBUTION
COST OF UNIT, SHORT LOCAL LINE AND DISTRIBUTION
KW COST AT BUS BAR
KW COST AT BUS BAR



Self-contained highway units are built in sizes to 500-kw, largest practical due to length and weigh limitations. Without house, below, components are seen. L. to R., cooling system, 8-cyl 567C engine, alternater, and manual switchgear.

short-duration peak loads may be forestalled by the use of diesel generator sets for peak skimming.

Another real service that can be rendered is the improvement in service by end-of-the-line voltage pickup. Also, line losses can be reduced by installing intermediate booster plants. These are some of the more obvious applications and others are bound to develop as time goes on. Of course, a Civil Defense role is obvious.

Still another carryover from railroad techniques is multiple-unit operation. While 1000 kilowatts is only peanuts compared to central station capacity, remember that we are talking of fringe areas. Also remember the size and weight limitations imposed by tunnels, bridges and roads, etc. Along with these facts, Mr. Dezendorf commented on the advantages of flexibility attained by the use of multiple units. The required number of units can get quickly into operation to meet a temporary load condition, after which the individual units can be dispersed to other jobs. As in the case of multiple-unit locomotives, this greatly increases the utilization percentage.

Economics

No one is going to argue that you can produce electricity by sets of this type as cheaply as it can be produced in large central station operation. But when you add up the corollary advantages of supplying power near the point of use as opposed to the alternative measures, higher generation costs are generally more than offset.

Some conditions might impose the alternative of increasing central station capacity or building additional small plants. As plant size decreases, costs per installed kw capacity go up. Naturally costs will vary with plant size and type, but will probably be somewhere near double the cost of these units.

Base price on these generating sets is $90 per kilowatt. This low figure reflects the savings through mass production facilities already set up for locomotive building. EMD's base price on locomotives today is about $102 per hp (lower than when they started), and it must be remembered that this includes not only the generating equipment but the power absorbing items (traction motors, etc.) as well. Also as in the case of locomotives, additional optional equipment is available.

At the demonstration, placards displayed prices of the various units. On the rail-mounted 1000-kw unit, for example, the base price was set at $90,000; trucks at $3000; automatic switchgear (manual control is standard) at $4800; air brakes at $300; and a 2400-gal fuel tank at $2200.

Automatic Features

To demonstrate the automatic capabilities of the units, two 1000-kw rail-mounted units were set up on a spur and connected to the utility's lines. One was mounted on pedestals with the trucks rolled out to show a typical semi-permanent installation. Control was effected from a large tent with the side raised to give the audience a view of the two units. A closed television circuit, having a camera set to pick up the various meters in one of the units and a number of receivers in the tent, made it possible for the audience to see what was going on. Both units were controlled from a panelboard in the tent.

Starting impulses can be given to the units in a number of ways—pushbutton, radio, telephone, voltage relay, or carrier current. The first three methods were used. It took an average of 45 seconds to get a unit started, on the line, and loaded, once the starting impulse was given.

The television receivers showed the generator coming up to voltage as the engine started and reached speed. Voltage was automatically matched to line voltage and the generator synchronized in frequency and phase. As soon as it got on the line, the generator came up to load as seen on the wattmeter. Upon signal to stop, the generator was unloaded, the circuit breaker tripped, and the engine shut down after a cooling-off period.

Special gimmicks had been installed to show the effect of certain operating conditions. For example, line voltage was reduced by a step control to show that the generator controls would really match voltages. The use of a time switch stop with an under-voltage override was shown and the load response of the unit was demonstrated.

Another demonstration involved the trailer-mounted unit. The tractor brought the unit to a sub-station where an emergency was simulated. Taking it easy and announcing the steps, the generator leads were connected to

a transformer with a "hot stick" and in about 12 minutes the unit was feeding 500 kw into the utility's line.

The Equipment

GM's 567C engines in 6-, 8-, 12-, and 16- cylinder versions will be the prime movers in these generating sets. This is the latest refinement in the 567 series of engines that power over 15,000 locomotive units. There have been no changes in the basic engine. Thus, the features developed for the railroad field such as maximum interchangeability, "unit exchange" on all major components, and the nation-wide availability of parts and service, apply for this application.

This engine was also introduced as a dual-fuel unit for use in areas where natural gas is available. Some parts must be replaced for this service. New cylinder heads incorporating the gas admission valve must be used. Actuation is by pushrod from the camshaft, so new camshafts with the extra cams are needed. Pilot oil requirements of about 6% require a modified injector having a much flatter helix on the plunger in the area approaching fuel cutoff.

Present controls are not designed for automatic proportioning of oil and gas to meet load requirements should the gas supply fail or decrease. Should this happen, the unit would automatically go off the line and would be switched manually to diesel operation before being put back on the line. As this implies, the governor is also modified for dual-fuel service.

Pistons must also be changed. Dual-fuel pistons are characterized by a deep piston crown cavity which reduces the compression ratio down to about 14.8 to 1. Brand new equipment, of course, includes the gas valves, manifolds, throttle valves, and control linkages.

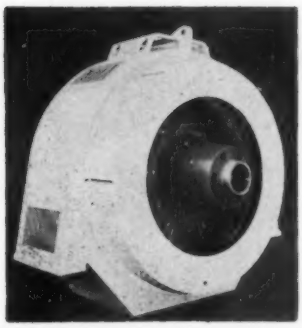
A new "A" series of alternators were designed to match engine characteristics. They turn 720 rpm (750 for 50-cycle operation) to produce 350, 500, and 1000 kw when coupled, respectively, to the engine sizes previously listed. All are designed to operate at 4160 or 2400 volts.

Earlier studies of improved insulation, part of the generator and traction motor development, are applied using silicone, glass, and mica. They provide protection during long shutdowns and also have the ability to withstand up to 25% electrical overloads.

Generator rotors are bolted directly to the engine flywheels with the outboard end supported in a single, spherical, self-aligning roller bearing. The 125-v DC exciter is driven by a flexible coupling from an engine auxiliary shaft.

All accessory equipment, is engine driven. GM did this on their locomotives, using an AC electrical system where mechanical drive could not be conveniently applied. In this case, an eddy-current clutch automatically provides variable fan speeds in accordance with cooling requirements. Field current variation is the method of control.

Switchgear was designed to include regulating, metering, and protective equipment. The most elaborate equipment is on the rail-mounted units. The 150,000-kva



New high-efficiency alternator designed and built for use with the 567C engine in the new "Electro-Mobile" power units.

circuit breaker is of the air-break, magnetic-blowout type. Special features were incorporated in the design of a voltage regulator (magnetic amplifier type) for the automatic control applications.

In addition to the voltage matching features mentioned earlier, the voltage regulator maintains proper excitation for any one of three types of operating conditions: (1) as a single unit to hold a given line voltage; (2) in parallel to share reactive kva proportionately with other units; and (3) in line boosting to supply automatically a variable reactive kva (within capabilities of the machine —unity to 0.8 power factor) as needed to hold a given line voltage.

Protective equipment includes three over-current relays: limited differential relay for ground protection, lightning arrestors, and surge capacitors. There is also delta-wye changeover equipment, synchronizing equipment, and the complete automatic control mentioned.

All of the mobile units, both cars and semi-trailers, are enclosed in sound-proofed housings. Steel was used for the car enclosure, but in the case of the trailer-mounted units aluminum was used since weight is so important a factor when it comes to highway use. Perforated sound-proofing material was used in both cases to line the entire enclosures. Special manifolds were developed and applied to the engines in this service to reduce their noise level in case they are required to operate in residential areas.

Editorial Comment

EMD appears to be starting out to create a new mass market for diesel engines. They did it before when they revolutionized the traditionally "tough" railroad field. And it helped the whole industry. One competitor recently commented, "If GM hadn't cracked the locomotive field, we wouldn't be in it today."

Through extensive application engineering, which is another way of saying good merchandising, and a good low-priced product, EMD is out to work with the utilities and prove what the diesel can do. Diesels have many advantages, but sometimes you must exploit them. So anything that tends to create more sales and greater acceptance will help the whole industry. With a bigger diesel pie, each will get a bigger piece.

Bird's-eye view of the Coliseum shop. Stores department is in foreground. Upholstery, marker, and welding and blacksmith sections are along left side. Battery, radiator and tank, and injection equipment repair are handled in similar stalls along right side (not shown) as are sheet metal and machine shop sections.

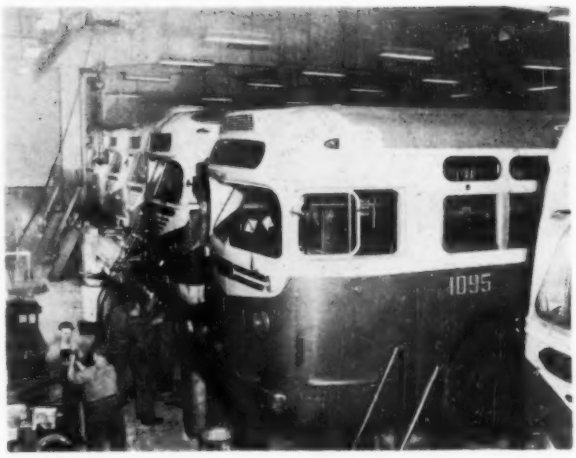
Bus Operation Costs Cut By Good Maintenance

No matter how good your maintenance program is, there should still be room for improvement. If you look hard enough, there will be some small item which can be improved. This is the philosophy of the Third Avenue Transit System.

"THERE is plenty of room for improvement in our maintenance operation". These are the modest words of Mr. William Novak, superintendent of maintenance, New York's Third Avenue Transit System, when recently interviewed by DIESEL POWER. Actually there are a good many who would be well satisfied with present results.

However, Mr. Novak firmly believes, as does the entire maintenance department on the system, that no matter how good the operation, there is always some small way in which it can be improved. Call it a philosophy if you like, but the fact remains that Third Avenue is constantly improving its maintenance program and has the figures to prove it.

Front end of the 7-stall section at the Amsterdam Avenue garage is depressed to pit level. The same arrangement has been used in the 4-stall section devoted to 3000-mi inspections. A walkway under parts department connects the two sections.



Back in 1946, for example, the company started replacing the trolley cars on some runs with modern diesel-powered buses. This was the beginning of the change-over and many problems presented themselves. At that time, mileage between major overhauls was only about 30,000.

Today, this figure has been extended to a fleet average of more than 80,000 mi, with some buses racking up 150,000 mi between major overhauls in this tough city operation.

During the switch to diesel-powered buses, Third Avenue faced much the same problems as did the railroads during their transitional period. Maintenance men had to be trained in diesel operation and maintenance. Track maintenance crews became a thing of the past and these men had to be fitted into new jobs; the motorman became a bus operator, and so on down the line. Facilities for maintenance had to be changed too.

Maintenance Facilities

These now include six garages and two maintenance shops. Garages are located: two in upper Manhattan; two in the Bronx, and two in Westchester. Both maintenance shops are located in the Bronx near the geographical center of the system.

Equipment in the garages includes that necessary for spot, periodic, and heavy maintenance, as well as periodic inspections. At the Amsterdam Avenue garage, for example, in addition to the main section (about the size of a city block), there is a separate 4-stall section for 3000-mi inspections, a 7-stall portion which handles 15,000-mi and 60,000-mi inspections and repairs, and a stall for cleaning. In the main section of the garage, there is a section which accommodates roughly 15 buses. Equipped with a lift, this 15-bus section is for what might be called running repairs or daily repairs. On the Third Avenue, they call it floor work.

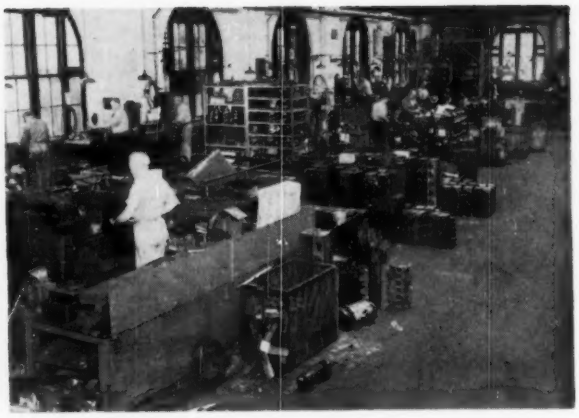
All rebuilding work for the fleet is handled at the West Farms and Coliseum shops. We'll take them in that order.

At the West Farms shop, equipment for the overhaul of engines, torque converters, and accessory equipment with the exception of injection equipment, will be found complete. Facilities for cleaning parts are provided in the rear section as is a small area for teardown. A complete machine shop and electrical shop are also under the same roof. Machine shop equipment includes Magnaflux

Street-door end of the 7-stall section. An overhead hoist is installed at this end, running parallel with the backs of the buses. Pits have steps at this end.

Injection section at the Coliseum shop. Facilities here include that necessary for the rebuilding and testing of GM and Bosch injection equipment. Fixture at left foreground is for testing "Shutterstats".

Electrical section of the West Farms shop. All electrical assemblies including starters, generators, voltage regulators, etc., are rebuilt here.



Part of the main rebuilding area at the West Farms shop. The cylinder head section is in the foreground and the area for assembly and disassembly of torque converters, in the rear.

inspection gear, a crankshaft grinder, and a horizontal milling machine rigged for align-boring main bearing saddles, in addition to equipment normally found in an automotive machine shop.

Equipment necessary for the complete rebuilding and testing of starting motors, generators, voltage regulators, and the like, is included in the electrical shop. This shop, as with the machine shop, is separate from the main shop area which is divided into sections. Torque converters are rebuilt in one section where special rotary stands permit mechanics to position the assembly in the most advantageous position for teardown and reassembly.

Another section is devoted to cylinder head testing and assembly, and still another to the reconditioning of air compressors. Adjoining the engine rebuilding section is a separate building which houses the paint shop.

Injection equipment, radiators, batteries, the all-important fare boxes, and body work go to the Coliseum shop which is the larger of the two shops. Air brake equipment, with the exception of air compressors, is rebuilt here. A sheet metal shop handles body repair work. In another section, upholstery work is done and next to that, bus marker signs are made. A forge and welding section is also included, as is a machine shop. The largest single area in this shop is perhaps the parts department.

This is the main parts section for the entire fleet, and since Third Avenue rebuilds everything that can be rebuilt, the stores department has an even bigger job. In addition to the parts required for rebuilding operations, a stock of replacement assemblies must be kept on hand for the garages to draw from.

Maintenance in Action

Since the layout of the Amsterdam Avenue garage has been explained, it might be well to stay with it while showing how the maintenance program works. Other garages operate in a similar fashion.

Garage maintenance personnel are divided into a 3-shift operation with the bulk of the mechanics being on the day shift. The night shift consists mainly of cleaning and shifting personnel and a few mechanics. The reasons for this are obvious.

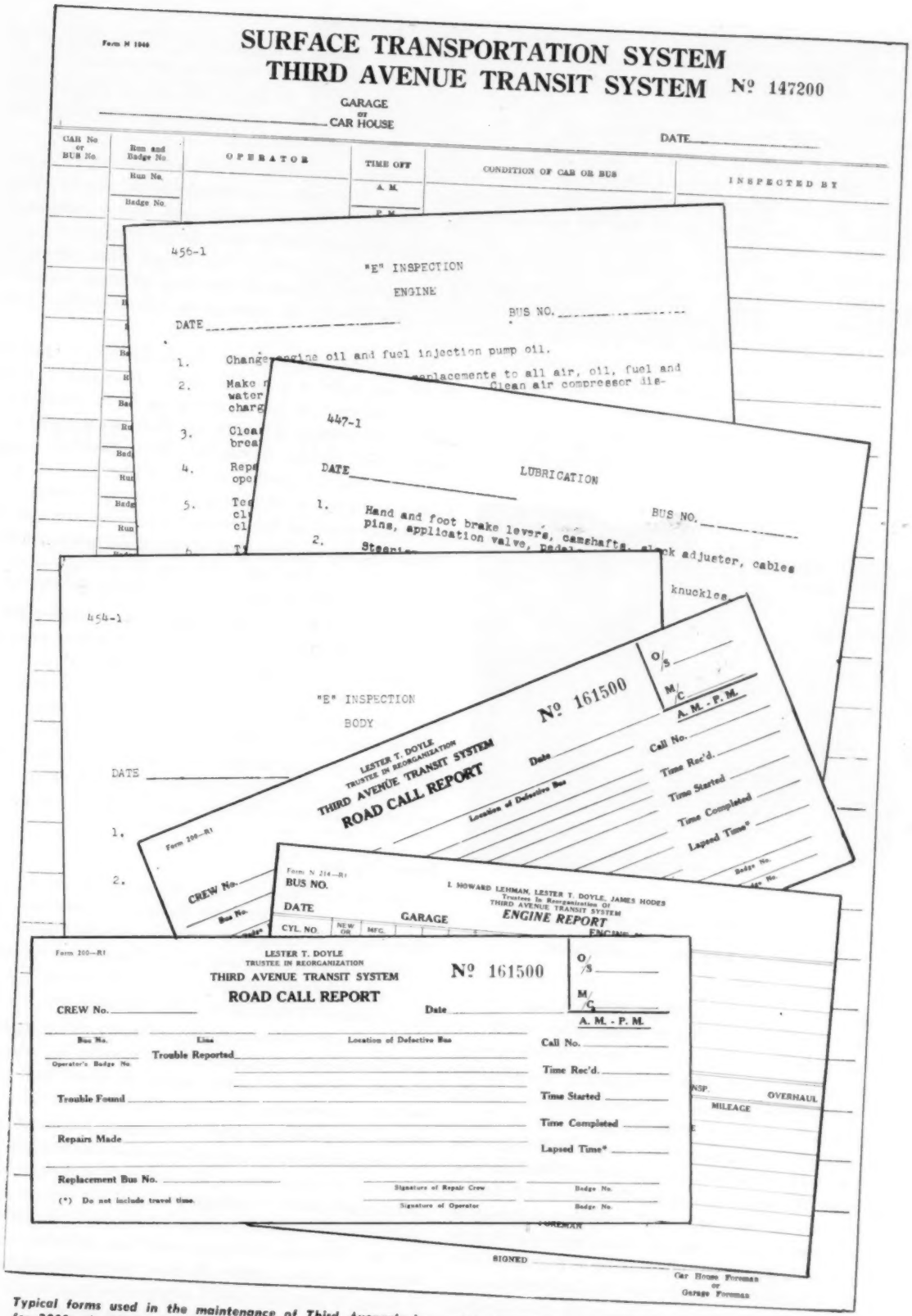
Maintenance is performed on a daily, 3000-mi, 15,000-mi, and 60,000-mi basis. Daily maintenance starts with every bus being checked as it enters the garage at the end of a run. In some cases where a bus is used for service during the rush hours, it is checked twice a day since it returns to the garage after the morning rush and again after the evening rush.

Upon returning to the garage, the driver leaves the bus just outside the fuel-island entrance to the garage. If he has noticed any defects during the operation of the bus, the driver makes appropriate notations on the "door sheet". This is where cooperation between the transportation and maintenance departments counts.

At this point, a shifter takes over, pulling the bus into one of the three fuel-island lanes. The fuel and lube oil required for the unit become a matter of record and excessive lube oil consumption usually raises a few eyebrows. The "door sheet" is checked and if an "OK" appears in the "condition" column, the bus is run through an automatic washing machine and put on the line for the transportation department. Incidentally, between 45 and 50 units per hour can run through the fuel islands and washers.

Should a defect of some nature appear on the "door sheet", it is immediately checked out. Defects of a minor nature such as brake adjustment and the like, which require only a few minutes time, are in many cases made over pits located between the fuel islands and the washers.

Most minor repairs, adjustments, and unit replacements, however, are handled in the floor work section of the garage adjacent to the fuel islands. "Floor work" consists mainly of the replacement of smaller component as-



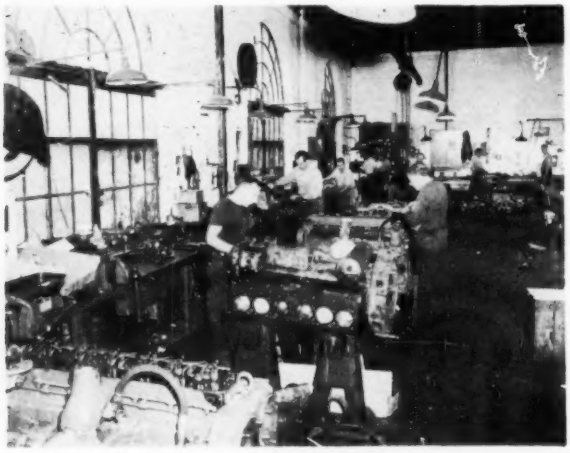
Typical forms used in the maintenance of Third Avenue's buses. The largest form is the "door sheet". "E" inspection is for 3000 mi. Additional work required at the 15,000-mi point is listed at the bottom of the "E" sheets. Engine Report is made out at the so-called 60,000 inspection. Road Call Reports are self-explanatory.

semblies such as starters, generators, air compressors, and adjustments. Where repairs are of a heavier nature, the bus is sent to the 7-stall portion of the garage where heavy repairs are handled.

Buses due for an inspection are singled out by the shifter at the fuel island in accordance with a list provided by the foreman. These are routed to the proper area. Units due for 3000-mi inspections are sent to the 4-stall section of the garage which handles this work only.

Manning the 3000-mi inspection section are 14 men. These include two body men, two electricians, three engine mechanics, six chassis men, and one utility man. Approximately seven complete inspections are turned out of this section in one day. This includes making repairs found necessary during the inspection. A typical inspection sheet for the engine is shown.

In addition, just before a unit chalks up 3000 mi, a sample of the crankcase oil is taken and sent to an independent firm for analysis. If oil samples indicate, for example, excessive fuel dilution, water wear metals, or road dirt, a bus can be taken out of service before serious damage occurs. The 15,000-mi inspection includes the 3000-mi inspection plus further servicing of assemblies which becomes necessary at this point.



Engine rebuilding section of the West Farms shop. Different parts from the same engine, all bearing the same number, converge on this point after being rebuilt or reconditioned.

The 60,000-mi inspection is the next one. Actually this is in name only as the inspection occurs at 80,000 mi now. At this point the engine is partially dismantled and checked for wear, and an "engine report" is made out listing all work performed, units replaced, tolerances, etc. A copy of the engine report is then forwarded to the main office where it is studied by the brass. The report either fits into the overall fleet pattern or questions are raised as to why this part was replaced sooner or why was there there so much more wear on these parts as compared to the fleet average.

Engine Overhauls

When an engine is scheduled for an overhaul, above 150,000-mi, the complete engine torque converter assembly is taken out of the bus at the garage and replaced by a rebuilt unit. The engine requiring the work is then sent to the West Farms shop.

Here, engines are disassembled, cleaned, inspected, and rebuilt in accordance with manufacturers' specifications. As each engine is torn down, each part is numbered, cleaned, and inspected for wear. All parts from one engine receive the same number. This system allows the parts to be scattered throughout the shop at their respective repair points and still converge in one spot after reconditioning.

Those parts which cannot be reclaimed or reconditioned are replaced with new units. However, as mentioned previously, anything which can be salvaged is rebuilt or reconditioned. This is the basis for maintenance on the Third Avenue system. No part is discarded unless it has reached the absolute end of its life. To boot, cost figures are kept on all phases of the entire maintenance and repair operation. Each repair station handles a specific part with engine and component assembly being handled on a production line basis. Between 20 and 25 complete overhauls are turned out at this shop each month.

When a bus reaches the point where extensive body work must be done and the replacement of wiring becomes necessary, the unit is run into the Coliseum shop. Here, the engine and torque converter assembly are removed and sent to the West Farms shop as the first step.

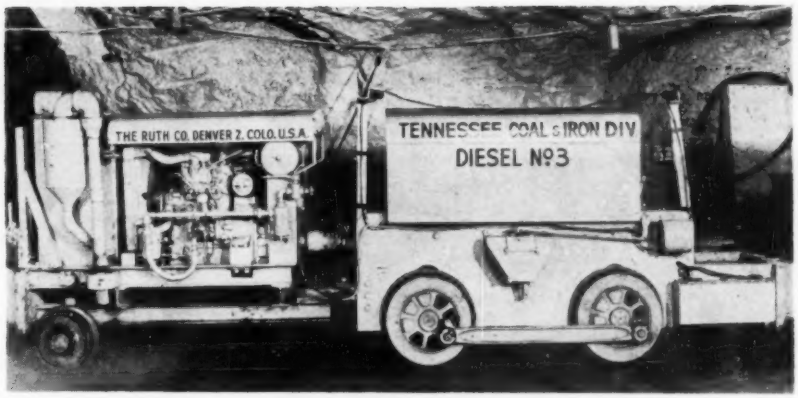
Following this, the bus is completely stripped of wiring, seats, and body panels, where necessary, and the bus completely rebuilt. When completely rebuilt, these units are sent to the paint shop and placed back in service.

Summing Up

Backing up Third Avenue's maintenance set up, is a continuing research program designed to increase mileages between servicing and overhaul periods. This consists of comparing, for one thing, air filters—an important item when one remembers that several tons of dirt fall on each square mile of New York City each day.

Fuel characteristics are also currently under study to determine if more complete combustion can be obtained through the use of another grade of diesel fuel which will at the same time fit the economic picture.

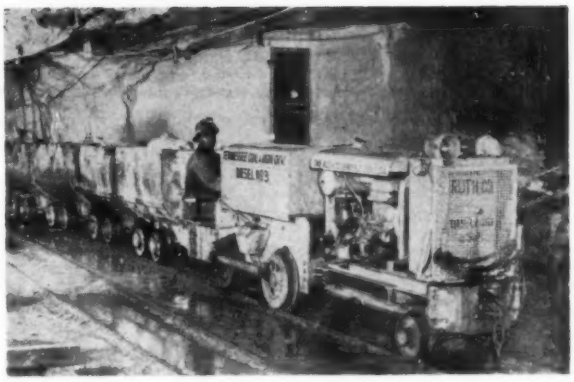
Close check is also kept on different makes of buses running on the same route to determine which is the most economical from both a maintenance and operational standpoint. Shop procedures and tooling are constantly under study too, with maintenance supervisors watching for that some small way in which the operation can be improved. But to further illustrate the job Third Avenue is doing, it must be stated that what has been accomplished reflects the careful planning of management in spite of the financial limitations arising out of the fact that the company is in the process of reorganization.



Engine and driving mechanism are separate and are carried on two chassis to permit operation on short radius curves. The engine is connected to the driving mechanism by a fluid coupling.

Four Years in a Zinc Mine

At the Jefferson City Zinc Mine, diesel mine locomotives have been operating underground for more than four years without a major overhaul.



Locomotives pull an average of 16 loaded cars per trip to the mine shaft. Each car holds 35 cu ft or approximately 1-3/4 ton.

BACK in December, 1949, a diesel-powered mine locomotive was put in service at the Jefferson City Zinc Mine. Since the installation of this first unit four similar units have been purchased. At present four units are underground with the fifth unit serving as a spare.

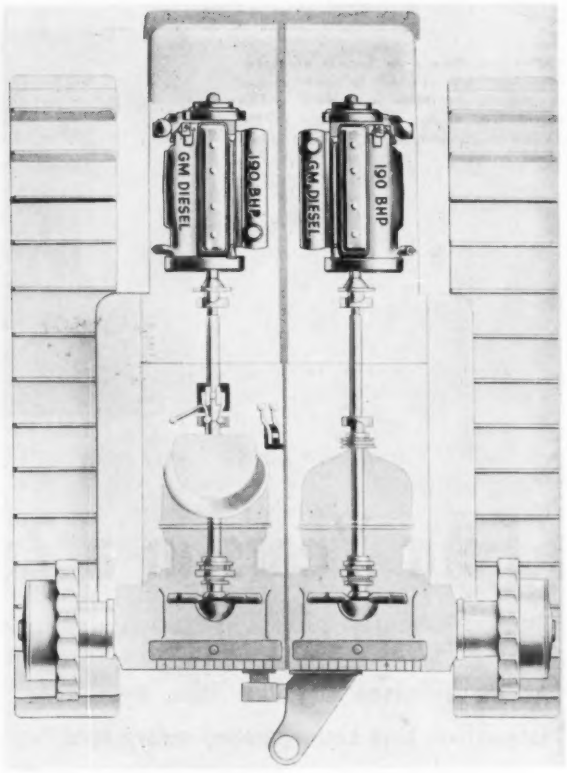
The five locomotives were built to operate within the space limitations of this particular mine, which incidentally is part of United States Steel Corporation's Tennessee Coal and Iron Division, and are all powered by Hercules.

Measuring 48-in high by 39-in wide by 14-ft long, the locomotives are of the trammer-type. Power is supplied by a 2-cyl, 4-cycle, indirect injection Hercules Model DIXD diesel rated 20 hp at 1200 rpm and 30 hp at 1800 rpm. All five engines are equipped with stainless steel exhaust gas conditioners, mounted on the front of the engine unit.

Reportedly, the first engine is still operating efficiently without a major overhaul. This is attributed to the well-planned preventive maintenance program in force at the mine. Down-time has also been kept at a minimum by the preventive maintenance program.

The operating company, which helped to pioneer the use of diesel locomotives underground, is firmly convinced that these units can be operated safely underground. To insure safe operation, normal precautions are taken to assure proper mine ventilation and other protective measures recommended by the U. S. Bureau of Mines.

Today, many mining operations are considering the use of economical diesel engines in underground service. The diesel has been safely operated underground in European mines for many years and sufficient experience gained, both abroad and in this country, to demonstrate that modern underground diesel locomotives, when operated in strict conformance with the recommendations of the U. S. Bureau of Mines, can be used safely and efficiently in this type service. Full utilization of the diesel's economies is yet to be realized in this application.



Each engine transmits power to a separate track through an Allison Torqmatic transmission having three speeds forward and three in reverse. This provides independent speed and directional control for each track, giving the crawler unique flexibility.

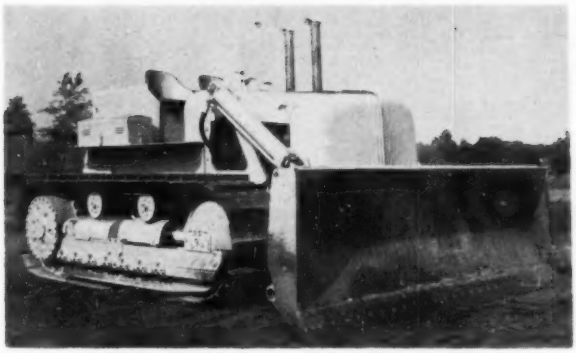
Twin-Engine Crawler

GM's Euclid, Allison, and Detroit Diesel divisions have put their heads together and come up with a crawler tractor powered by two "6-71" diesels, driving through Torqmatic transmissions.

EUCLID recently staked its claim to the crawler tractor market when it unveiled the Model TC-12. This new crawler was developed through the cooperation of GM's Euclid, Allison. and Detroit Diesel divisions.

Power to the tune of 380 hp is supplied by two Series 6-71 diesels, each driving through an individual torque converter and Torqmatic transmission. Each power train drives one track. Final drives are the same Euclid Planetary gearing as used in off-highway 50-ton dumps and the 25-yd bottom-dump wagon.

The two separate drive and track assemblies are free to oscillate on a 7-in transverse shaft and may also be separated for shipment where size and weight restrictions are encountered. The 2-section construction has been



New Euclid Model TC-12 crawler viewed from the business end. Slight offset seen where two halves of hood meet results from the 7-in free movement allowed between tractor halves.

Radiators are rear-mounted to keep leaves and other such debris from blocking cooling and for protection. Hinges at lower end of radiators permit easy access to transmissions.

designed to afford flexibility over uneven ground and allow the tractor to maintain good traction. The free 7 in movement is limited by stops which are welded to each frame half. For application where oscillation is not desirable, some of the tractors will be field-tested with rigid mounting on the cross-shaft.

There are two transmissions, each with integrally mounted torque converter. The transmission provides three speed ranges forward and three in reverse. All shifting is accomplished under full power. There is no master clutch.

The tractor can be shifted from one speed range to the other without loss of motion, and can be shifted into reverse while still going in the forward direction. The transmission provides adequate speed selection for all operating conditions. Top speed is 8 mph.

The "twin power" arrangement reportedly permits a fast, flexible steering system which increases workability. The Euclid tractor can be steered in several ways: by increasing or decreasing the speed of one engine for gradual and even change in direction; by putting one transmission in neutral and applying a track brake; or sharp and rapid turns under full power can be made by putting one transmission in forward and the other transmission in reverse. The choice as to the method of steering should assist the operator in shortening his cycle time.

Excellent accessibility is achieved for all components. The tractor can be dismantled and reassembled with ordinary servicemens' tools. The engines are mounted side-by-side and drive through universal joints and drive shafts to the torque converter which is located below and to the rear of the operator location. The converter, transmission, reduction gearing, and steering brake form one complete removable assembly. The reduction drive gears for each half of the tractor transmit power through an axle shaft to the sun pinion and the 3-gear set of the Euclid planetary, located within the drive sprocket.

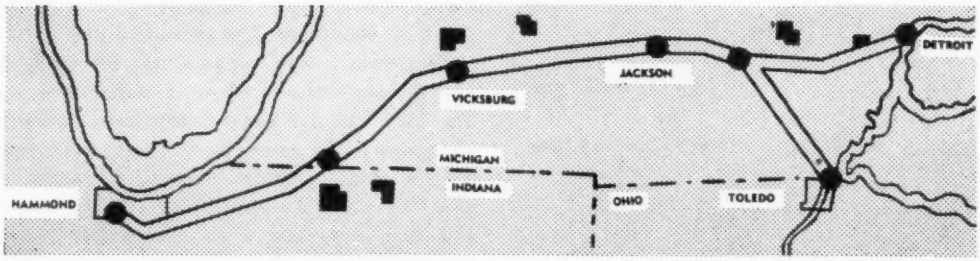
The Euclid TC-12 can be almost completely dismantled without removal of the roller frames. This is unique in the industry and permits easy access to all of the final drive parts. An experimental track tensioning device based on hydraulic principles is being tested on these machines.

To permit ready access to the engine, the front hood cover of each tractor half is hinge-mounted. In order to make the operator's position free of dust and objectionable heat, two radiators are located to the rear. The radiators are hinged to rotate out of the way for access to the transmissions.

The Model TC-12 is the first of a projected line of tractors that will meet requirements for earthmoving, open pit mining, logging, and industrial applications. It is the vanguard of 20 units to be placed in experimental field service for further testing.

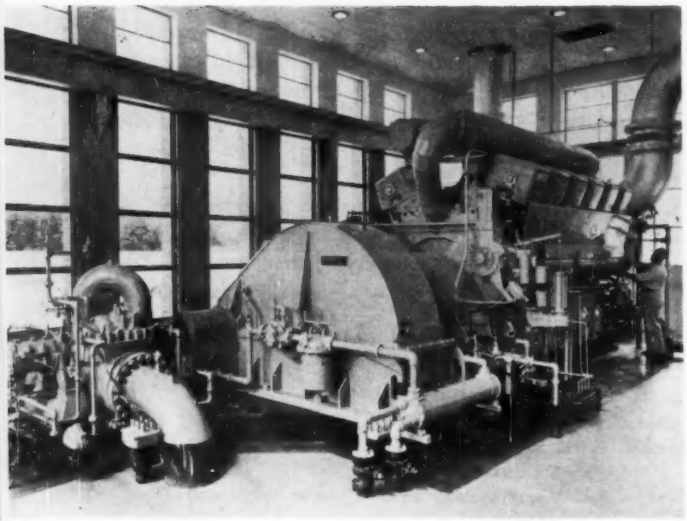
Specifications

Horsepower: 380. Two GM Model 6-71 diesel engines.
Weight: 53,000 lb approximate bare, 65,000 lb with bulldozer and other attachments.
Drawbar Pull: Maximum almost equal to tractor weight with working accessories.
Travel Speed: 0 to 8 mph, with three speeds.
Fuel: GM Detroit Diesel fuel specifications.
Starting Method: Electrical
Track: No. of shoes, each side 39
Width of standard shoe ..... 26 in
Height of grouser ..... 2⅞ in
Length of tracks on ground ..... 115⅝ in
Area ground contact with shoes ..... 6000 sq in
Transmission: Two Allison Torqmatic drives, CRT-5530.
Steering: With engines, transmissions, and brakes.
Clutch: Not required.
General Dimensions: Length ..... 15 ft
Width ..... 11 ft, 4 in
Height (without exhaust stacks) ..... 8 ft
Ground pressure ..... 8½ psi bare



Wolverine Pipe Line Sets New Efficiency Standards

Modern design and engineering features, unique in the history of the pipeline industry, are combined in the new 295-mi, 16-in Wolverine pipe line.



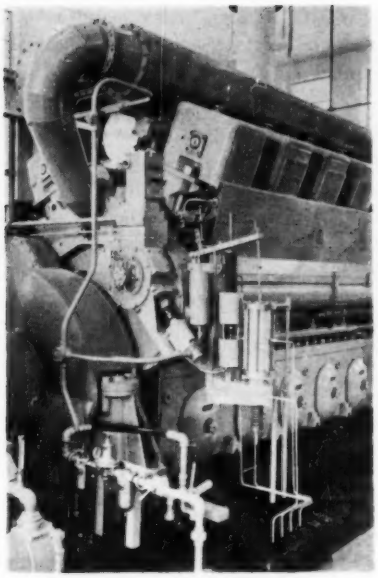
At the Vicksburg station, a 2650-hp Nordberg drives a 3220-gpm centrifugal pump through a 10.189:1 speed increaser

LITERALLY no stone has been left unturned to make the Wolverine system the most modern products carrier in operation today. The new line begins at Hammond, Ind., running eastward to a point near Ann Arbor, Mich. where it branches into two segments, one continuing to Detroit, Mich. and the other to Toledo, Ohio. It is a common carrier available to all shippers and subject to ICC regulations. Its owners are Shell Oil, Cities Service, and the Texas companies. The former company was in charge of design and construction.

The Wolverine system receives shipment of products through private feeder lines from the Cities Service refinery and the Shell and Texas terminals in nearby East Chicago. It delivers the various shippers' products to their terminals at Niles, Jackson, and Detroit, Mich., and Toledo, Ohio.

With a current capacity of 4,000,000 gpd of petroleum products, the line is now being employed to transport diesel fuel, No. 3 fuel oil, premium and house brand gasoline, kerosene, and prime white. The line capacity may be boosted to 7,350,000 gal by adding more pump stations. Currently there are two pumping stations, one at Kennedy Ave. in Hammond and the other at Vicksburg, Mich. The Kennedy Ave. station is the key operating point for the entire Wolverine system. Here two large 2-stage pumps, each driven by a 1250-hp electric motor at a speed of 3600 rpm, provide the initial pumping pressure for the line.

Control of operations is centralized in a separate building. Lights on a large control console indicate the position of all tanks, valves, meters, and pumps on the line and show which are operating. The station operator has fingertip



A remote-control system is used to start the engine. A close-up of the automatic starting system is shown above.

through a 10.189 to 1 (500 to 5094 rpm) high-speed, herringbone-gear speed increaser. At a speed of better than 5000 rpm, the one pump develops as much pressure as the two identical pumps at the Kennedy station.

The new Nordberg engine, first of this V-type to go into operation, has 12-cyl of 13-in bore and 16½-in stroke. It is of 4-cycle design, employing the Supairthermal system, and develops rated bhp at 500 rpm. The Supairthermal engine, designed for more compact and efficient generation of power, features high-pressure turbocharging, intercooling, and variable compression ratio. The Vicksburg engine is presently operated up to 2000 hp without intercooling. With intercooling, its rating is increased to 2650 bhp, equivalent to 160 bmep. Later, it is planned to install a 3 to 1 pressure ratio turbocharger and increase the rating to 3200 bhp or 190 bmep.

In contrast to Kennedy, the Vicksburg pumping and control facilities are housed in a single building of modern brick construction. The station is divided primarily into three operating sections—the engine pump room, auxiliary room, and control room. All three rooms are attractively tiled and painted, assuring clean, pleasant operating conditions. The station, in addition, has a lavatory and shower and a tool and repair room.

Good housekeeping shows itself outside as well as inside the Vicksburg station. This is also typical of the other stations on the Wolverine system.

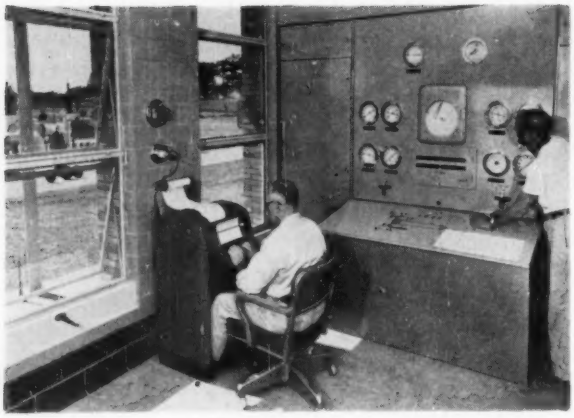
control over all equipment and by pushing a single button, he starts product flowing from any one of the shipper's tanks. In a similar way, the operator starts and stops one or both of the station pumps.

The Kennedy operator can, if necessary, extend his control more than a hundred miles to the Vicksburg station via teleprinter hookup. He can dial code numbers to start or stop the pump at Vicksburg and also, by dialing other numbers, obtain an automatic report of operating conditions at that distant station.

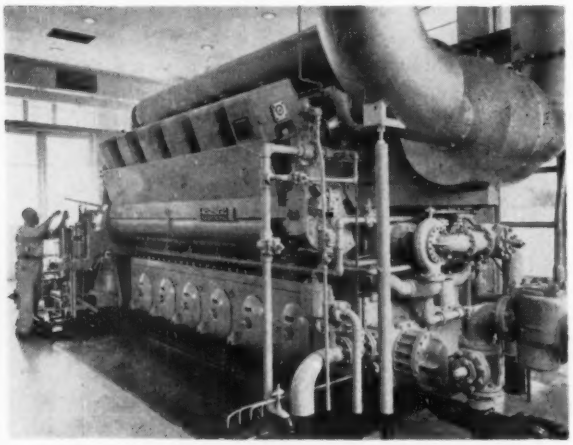
The Vicksburg station is markedly different from Kennedy and is under charge of Chester C. Curvey, chief operator. Here power is supplied by a 12-cyl, 2650-hp Nordberg V-type Supairthermal diesel, reportedly the largest of its type ever installed on a pipeline. The diesel drives a 2-stage centrifugal pump rated 3220 gpm at 2152 ft head

Safety was an important consideration in the layout and design of the system. Automatic controls at the Vicksburg station are typical of the care given this feature which makes pipelines the safest known method of transporting petroleum products. Controls are established so that any departure from regular operating pressures, temperature, etc., both in the line and on the pumping unit (i.e. high or low lube oil pressure, high cooling water temperature, engine overspeed), will shut down the equipment and in certain instances the entire station. Mercoid controls are installed where required, with the central control box located in the auxiliary room. A loud alarm alerts the operator and an annunciator on the control panel indicates the cause of the trouble.

Maximum line operating pressure is established at 900



Control room of the Vicksburg, Michigan station. Note station diagram and lights on lower control panel. Teleprinter is an important part of the system control network.



Turbocharger end of the Nordberg Vee-type engine. Operator is adjusting lever on the automatic starting system.

Principal Equipment-Vicksburg Station

Pumping engine	Nordberg Mfg. Co
Speed increaser	Farrel-Birmingham Co., Inc.
Pipeline pump	United Iron Works
Flexible coupling	Thomas Flexible Coupling Co.
Governor	Woodward Governor Co.
Turbocharger	DeLaval Steam Turbine Co.
Flexible connector	Zallea Bros.
Expansion joint	Multiflex Co.
Blower	American Blower Co.
Intake air filter	Air-Maze Corp.
Exhaust silencer	Maxim Silencer Co.
Fluid cooler (radiator)	Trane Co.
Lube oil filter	Hilliard Co.
Lube oil cooler	Kewanee-Ross Corp.
Temperature regulating valve	Amot Controls Corp.
Air compressor	Gardner-Denver Co.
Fuel oil meter	Brodie System
Before and after pump	Northern Ordnance
Magnetic strainer	Nordberg Mfg. Co.
Pyrometer	Illinois Testing Lab.
Speed indicator	Weston Co.
Pressure recorder	Foxboro Co.

psig, and overall direction and scheduling of the movement of products originates hundreds of miles from the line. This scheduling and other routine operations are carried on under contract by Shell's Products Pipe Line Dept., which has its headquarters in Radio City, N.Y.

There, in a remarkable dispatching room, dispatchers direct the products movement in a pipeline half a continent away. They maintain round-the-clock supervision of the entire line with the aid of teleprinters, carefully planned pumping schedules, and an ingenious dispatching board.

Key unit in following the pumping schedules is the dispatching board, a 17-ft counter-like device. This board serves as a crystal ball, giving an up-to-the-minute picture of the line and indicating at a glance exactly how much of what product is where at any time. A diagrammatic representation of the line, this board has markers representing the various stations and delivery points, and lights to show those in operation.

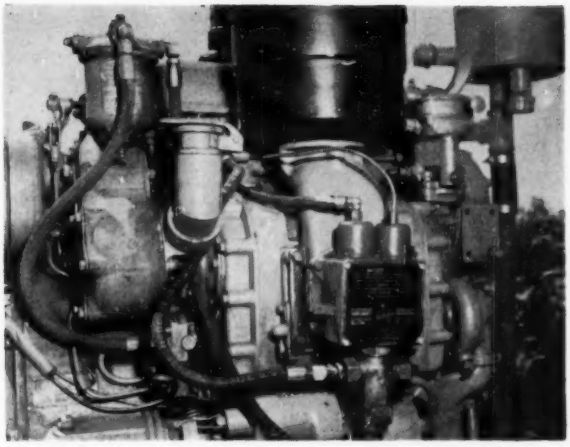
Products in the line are represented by lengths of paper tape, scaled so that an inch represents a certain number of barrels, and colored to identify the various products. So accurate is this system that the dispatchers are able to tell within minutes when a particular product will reach a determined point. For example, they can tell the deliveryman at a terminal to begin taking off 5000 bbl of premium gasoline at 2:35 pm and he will find the batch arriving on the dot.

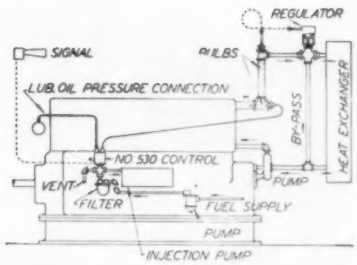
Remote control starting of the Nordberg engine pumping units at Vicksburg is equally ingenious and requires only 90 sec. This system for automatic starting and operation of pumping units is similar to that employed on Shell's north line from its Wood River refinery to East Chicago, and is referred to as the Norris Plank system. This system utilizes the usual engine governor only to prevent overspeed with the primary control of the engine functioning through direct hydraulic cylinders which position the fuel racks in response to changes in station suction and discharge conditions.

On a pushbutton or automatic start, following the motor-actuated opening of the main pump valves and the establishment of pump seal oil and engine oil circulation, the start cylinder receives air through a solenoid valve, extending its piston to open the fuel rack wide at the same moment starting air is admitted to the engine.

When the engine fires and differential pressure across the main pump increases, the solenoid valve to the idle cylinder opens, admitting air to retract the fuel rack to idle position. After a delay through an electric timer, the air is released at a controlled rate by means of a time tank, allowing the engine to transit from idle to control speed over a period of approximately 5 min. This multiple sequence insures time to warm up a cold engine and the gradual application of load.

The Wolverine system is a tribute to the people of the Shell, Cities Service, and Texas companies who, with progressive engineering and ingenuity, have established a new standard of pipeline efficiency.





Typical installation in engine system.

Photograph shows control mounted on engine.

Automatic Protection for Irrigation Engines

OUT on a large irrigation project in western Kansas, diesel engines have been installed to power deep well turbine pumps. Of course the diesels are giving efficient service. But in order that they continue to do so, two factors are involved. They must work continuously and with a minimum of attendance. For these reasons the engines have to be insured against breakdown resulting from some abnormal conditions usually evidenced by high jacket water temperature and low oil pressure.

To meet these special requirements, the company that made the engine installation got together with Fulton Sylphon to work out a dependable and automatic safety control. Allied in the enterprise were Kirk Campbell, sales representative for Fulton Sylphon, and Don Gardner, former general sales manager of Diesel Equipment Co., Inc., the General Motors distributor at Great Bend, Kans. Together, they decided that the No. 530 safety control would be most suitable for the application, and then they worked out an adaption for the engines in the field.

The adapted No. 530 control reacts immediately to shut off fuel supply should water temperature go above or lubricating oil pressure go below the safety point. In this event, any oil left in the fuel line between the control and the injection pump is allowed to drain back to the fuel supply tank. Should either the oil pressure assembly or thermostat assembly of the unit itself fail or suffer any injury, the safety control will also trip to shutdown position—an important feature of the control.

The control unit consists mainly of two outer parts—the housing containing the tripping mechanism, and a 3-way valve.

The valve, which is the under portion of the instrument, is placed in the fuel supply line of the engine, immediately ahead of the injection pump. The inlet is at the bottom. One side port of the valve is connected to the vent or drain pipe. The other side port connects to the line to the injection pump.

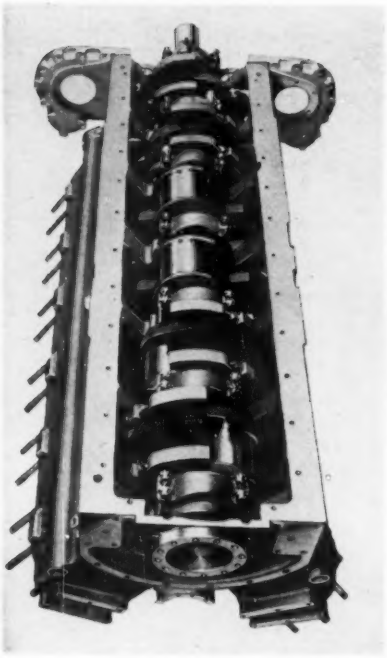
The housing body seats directly on the valve. It contains two outer connections, one to the lubricating oil line and the other to the circulating water line of the engine. It also contains a projecting lever for manual operation when starting the engine.

In normal engine operation, the control mechanism is in the position shown in the diagram. If engine conditions deviate from the point for which the control has been adjusted, a trigger arrangement releases the spring-loaded lever assembly and closes the fuel supply port in the valve. At the same time a vent port in the valve opens for fuel oil to drain back to the tank. An audible alarm is set off and the engine comes to an immediate stop.

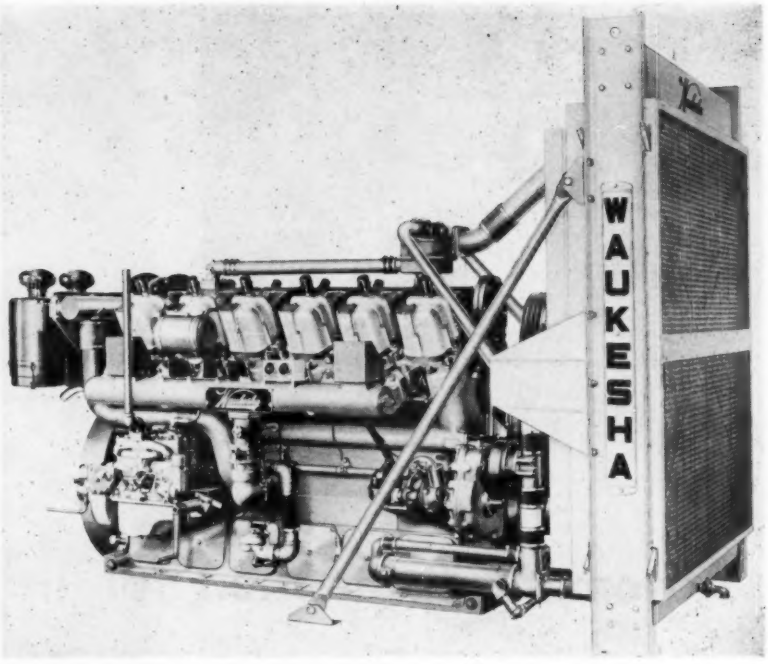
When normal conditions are restored, the control is manually re-started by lifting the control lever. However, unless the trouble that caused the mechanism to trip is corrected, the trigger operated by the lever will not engage.

The first installation of the control was made in March 1954. At present eight of the Fulton units are in operation mounted on 3-, 4-, and 6-cyl Series "71" engines, and one is installed on a 4-cyl Series "51" diesel. In all but one of the installations, the units are mounted on the breather intake housing bracket. The exception is mounted on a post away from the engine.

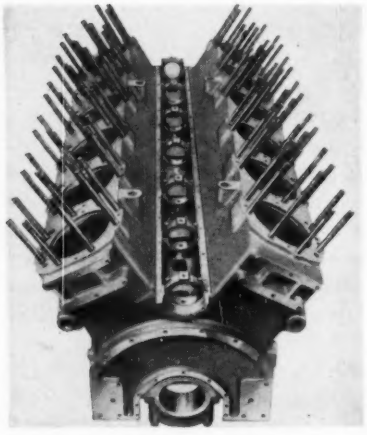
Thus far, the controls have worked very satisfactorily. Since their installation there have been two concrete cases where engines have been saved from extensive damage and shutdown time when loss of oil pressure and high water temperature occurred.



Heavy crankshaft is hung in crankcase portion of the rigid, wye-shaped cast cylinder block.



Latest and largest engine in Waukesha's line is the 12-cyl, 8½-in square VLR Series engine for diesel, LPG or natural gas operation.



Camshaft bearing seats are in center of vee. Heavy top decks provide rigid liner support.

Waukesha's 1100-HP Engine

Reduced weight, compact, V-12 power package is engineered for greater load and stand-up performance to meet modern industrial requirements.

MORE hole in a hurry is the ringing demand of the oil-thirsty market. On land and now on water, the producer calls for faster penetration, deeper drilling, and greater rig portability. To the tool pusher, this means a lot more mud at higher pressure, and flexible power equipment that will give greater horsepower and stand the gaff.

Chief factors in today's need for stepped up horsepower in the oil fields are heavier lines and deeper wells in general; deep test-well and offshore exploratory drilling; the high rate of mud dumping required for fast-penetration jet-bit drilling and high-pressure return of chips and cuttings outside the pipe and casing.

Waukesha Motor Company's answer to this particular need, which has its parallel in other industrial power appli-

cations, is the Model VLR series 12-cyl power unit available for use with propane-butane or natural gas fuel and as a full diesel, either normally aspirated or turbocharged. With the diesel units, complete parts and accessory kits can be purchased for conversion to gas operation.

This powerful new V-12 Waukesha is a high-compression, overhead valve, 60-deg vee, 4-cycle engine, with 8½-in bore and stroke and 5788-cu in displacement. Operating on butane-propane, it develops approximately 870 hp with radiator, fan, and air cleaners. Unit ratings of the normal diesel and the turbocharged version are approximately 800 and 1100 hp respectively. Bare engine ratings are higher.

Operating speed of the engine ranges from 600 to 1200 rpm. Maximum rpm and hp ratings for natural gas and butane-propane operation and for diesel operation with and without turbocharging are listed in the accompanying tabulation.

Turbocharging of the diesel unit affords a great increase in horsepower with a minimum of parasitic load. Twin turbochargers, operating from the exhaust in the vee of the engine, increase output through a range of from 25% to 35% varying with service speeds and accessory requirements. This is accomplished without intercooling. With no mechanical drive from the engine, the parasitic load of the turbochargers decreases at part engine load, improving overall fuel economy throughout the speed range.

The engine responds quickly to throttle and load and meets emergency or overload with a surge of reserve power. Strength, precision, and balance are built into all elements of the power train, and extreme rigidity of supporting members assures perfect alignment of moving parts. Main and rod bearings are easily accessible and major parts are interchangeable between right and left cylinder banks.

This new high horsepower engine reduces considerably and in some instances eliminates entirely the need for engine compounding. Where this is the case, advantages include: Initial cost of the unit is less than the cost of the two engines each with half the horsepower; weight is less making transportation, moving, and installation cheaper, easier, and faster; fuel consumption is generally lower; and actual output is greater. Altogether, it was designed as an economy engine—more efficient and more convenient—to give savings in horsepower dollars.

Weight reduction—particularly important in offshore drilling and marine installations—is achieved by use of aluminum wherever operating requirements permit: in the pistons, gear housing and cover, intake manifold, rocker arm covers, and oil pan doors. There is no sacrifice, however, in overall ruggedness, simplicity, and reliability.

General Features

Waukesha put their 45 years of experience in building heavy-duty industrial-type internal combustion engines into the design of this big, tough oil field power unit. Realizing the importance of being able to use the most economical fuel available in the locale, it was arranged for fast and easy conversion from one fuel to another. It will burn diesel fuel, natural gas, or the LPG fuels.

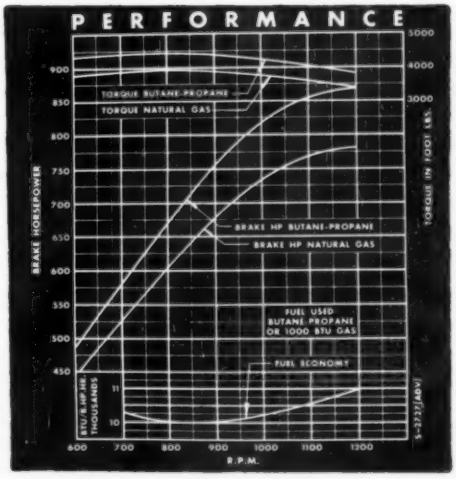
Diesel models of the V-12 series can be converted easily by use of a conversion kit. Principal conversion parts, assemblies, and accessories are grouped in the ignition, carburetion, governor, and cylinder head systems. Heads are factory-assembled and delivered with valves, springs, inserts, and guides in place. New gaskets, fasteners, and standard hardware parts are also provided.

Any competent mechanic can make the conversion in the field without special tools. The basic features contributing to the ruggedness and long life of the Waukesha diesels are unchanged on the gas conversion. Thus, power and efficiency are retained where gas is the most economical fuel.

Flexibility with respect to application also received maximum attention. For example, controls and instruments may be mounted on either side of the engine, or on both sides. Component and accessory locations and dimensions may be varied according to service and installation requirements.

Normally the engine is equipped with a 39-in or SAE 00 open flywheel and is well suited to fluid coupling and torque converter applications. Fixed stub shaft for direct coupling drive or heavy-duty power takeoff and clutch (with or without shaft extension and outboard bearing) may be specified as original equipment.

For positive starting over a broad range of climatic conditions and service applications, both gas and diesel versions of the engine are equipped with a 30-hp Waukesha gasoline starting motor with automatic pinion engagement and manual starting clutch. It can be mounted on either side. Its exhaust gas is used to heat the intake manifold on diesel operation and for easier, quicker cold-weather starting, the diesel heads have compression releases for relieving one bank of cylinders while starting on the other.



Also, all versions have a heating tube in the base oil pan for preheating of the lubrication oil supply with steam, hot water, flame, or starting engine exhaust. A choice is given because air starters may be used in place of the starting engine.

Flexibility as well as simplicity are features of the control system. An illustration is found on the VLR series units for operation on gas fuels. They are equipped with twin carburetors, one on each side of the engine. Both carburetor throttle shafts are coupled to the ends of a single cross shaft extending through the crankcase center main bearing support web, in effect, becoming a single shaft.

With this synchronized control, both cylinder banks produce equal horsepower when the carburetors are suitably adjusted. The arrangement lends itself to remote operating control and is a vast improvement on conventional multiple lever and linkage designs. Governor-carburetor linkage is straight and simple without appreciable play or looseness, thus providing quick engine response to governing action.

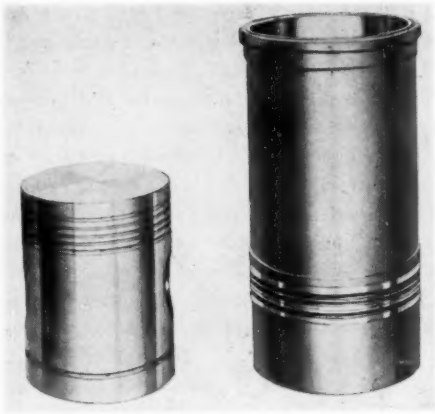
The built-in and self-lubricated Waukesha governor is a centrifugal, close-regulating type with good non-hunting characteristics. Where desired, hydraulic governors may be specified for either gas or diesel units and they are applied without special mounting arrangements.

Other features are concerned with factors designed to provide long service life, to facilitate servicing, and to provide maximum interchangeability of parts. Typical of the first objective are the Stellite-faced valve faces and Stellite seats, jet oil-cooling of the heavy-duty aluminum pistons, and the careful attention to balancing.

Regarding the last, the big forged steel crankshaft is statically and dynamically balanced as well as being counterbalanced. Also, it is equipped with a front-end-mounted vibration damper. Connecting rods and piston assemblies are matched for weight for better balance. Smooth operation is the apparent result, but also uneven loads and their fatigue effects so characteristic of unbalance are avoided.

Service is simplified by designing for maximum accessibility. Large oil pan doors provide for easy inspection, cleanout, as well as main and connecting rod bearing replacement from outside the engine. The lube oil pump is externally mounted for access and for pressure regulator adjustment. Use of individual cylinder heads permits easy removal by two men without interference from other parts and accessories. This makes for easy repair and maintenance of the entire upper valve mechanism carried in the heads, removal and replacement of cylinder liners, and easy conversion for burning different fuels.

Wherever possible, multiple parts are identical for maximum interchangeability. For example, coolant pumps are interchangeable although each supplies its own cylinder bank, discharging into a common reservoir in the top of the radiator assembly. Following up some of the earlier ideas expressed, these pumps have ball bearings, self-lubricated for life, and have carbon-type rotary pump seals that can be changed without removal of the pumps from the engine.



Close-grained alloy iron is used in the wet cylinder liner. Heavy-duty aluminum piston is jet oil-cooled.

Engine Details

This more detailed description is written around one engine model, VLROBU (gas model unit), just to tie things down. This engine, like the others, has 12 individual and interchangeable cast alloy iron cylinder heads. Coolant passages and flow are arranged to eliminate hot spots. Each head carries the complete rocker arm and valve mechanism for one cylinder. Cast aluminum valve mechanism covers are interchangeable. Intake and exhaust valve seats are Stellite.

The wet-type cylinder sleeves of close-grained special alloy iron are interchangeable and readily replaceable. They are completely machined for uniform wall thickness and triple-ring neoprene-sealed at the lower end. The crankcase-cylinder block is a single, wye-shaped casting of iron alloy. Cylinder sleeves are set in the block, six along each side of the upper vee. Line-bored large-bearing-area camshaft and crankshaft seats, heavy webs between cylinders, and thick top decks assure permanent, positive alignment of all power-train parts.

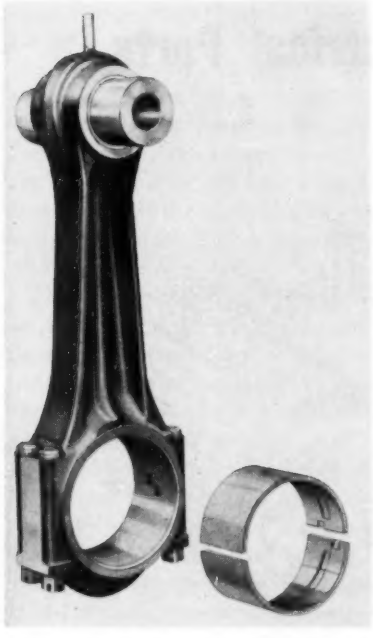
Heavy-duty aluminum alloy pistons have under-the-crown cup inserts that serve to retain the cooling oil. Each piston has five rings, all located above the pin: three straight-side compression rings, a straight-side compression scraper, and a bottom straight-side oil control ring. Hollow, 3-in diam piston pins of the full-floating type are hardened and ground to exact dimension limits and selectively fitted to pistons and rods.

A 7-bearing, counterbalanced crankshaft is drop-forged, heat-treated steel. Massive main journals are 6½ in; crankpins, 5¾ in. The journals are hardened to 450-500 Brinell and ground to Waukesha quality control standards. Fillets between all journals and cheeks are generous. The crankshaft is rifle-drilled for full-pressure lubrication of all bearings.

"I"-section connecting rods are drop-forged, heat-treated steel, matched for unit weight. Two opposing rods are mounted side by side on each crankpin. Deeply ribbed caps are secured by four heat-treated bolts and castle nuts. Rifle drilling provides for pressure lubrication to the piston pins. Large bearings are steel-backed, precision-type, copper-lead shells. Pin bushings are hard bronze.

The main bearings, also steel-backed, precision-type copper-lead shells, are supported in the upper half of the crankcase and in the seven heavily ribbed caps, each secured to the crankcase with four heat-treated studs with castle nuts and locks.

Overhead intake and exhaust valves are chromium-silicon alloy, Stellite-faced, and end-threaded for screw and nut retainers. The exhaust and intake valve seats are Stellite inserts. Timing gears are helical-cut, wide-faced gears of mild steel. Idler stud and accessory drives are equipped with anti-friction bearings.



Husky connecting rod assembly showing trimetal bearing shells, heavy piston pin and at top, piston oil jet.

A single camshaft mounts in the engine vee. Bearings are the precision-type, steel-backed and babbitt-lined, and readily removed for inspection or replacement. Integral cams are designed for roller valve tappet operation. Pushrods are in the vee, but outside the cylinders, and also easily removed.

An externally mounted, positive-displacement, gear-type pump, equipped with adjustable pressure regulators, furnishes full-pressure lubrication to all main bearings, connecting rod bearings, piston pins and crowns, camshaft bearings, and timing gears. Oil is supplied intermittently to the valve mechanism and roller tappets.

A large-capacity, series-connected oil cooler is mounted on the engine and equipped with a bypass relief valve. The oil filter is a large-capacity, full-flow type, separately mounted.

Each engine bank is served by its own gear-driven, high-capacity coolant pump which forces water through the crankcase, cylinder heads, and exhaust manifold. Rapid warmup and constant operating tempeartures are controlled by multiple thermostats, and large bypass lines serve to prevent excessive pumping pressure during this period. The radiator is a large-capacity sectional-core type (four sections), with fan, fan belts, fan guard, and front guard.

Each of two intake manifolds is equipped with backfire valve, flame-arrestor, carburetor, regulator, and pressure gauge. Each cylinder bank has two oil-bath air cleaners with rain caps, mounted at the rear of the engine. Gas cylinder compression ratio is 6.75 to 1. Dual ignition is provided by two high-tension, fixed spark magnetos with automatic-retard impulse couplings. Two 18-mm spark plugs are mounted in each head.

A liquid-cooled exhaust manifold is mounted in the engine vee, and equipped with an outlet at each end, again in the interest of application flexibility.

The oil pan is a cast-iron box base equipped with access doors for checking or replacing main bearings and rod bearings. As mentioned, the pan has a heat tube for preheating lubricant in cold weather.

Summary

According to Waukesha, development of the new VLR series engine came about "largely as the result of continuing attention to distributor information, magazine and trade reports, and direct field contact with drilling contractors, rig builders, and job operations." It is in accordance with the current trend of applying more horsepower in all sorts of jobs.

This is true in other fields besides the drilling industry. Other important applications are foreseen in feeder pipeline pumping, heavy compressor operation, power generation of all types, various offshore and work-boat operations, and in the fields of logging, quarrying, mining, etc., where the demand for higher horsepower units is ever increasing.

Maximum Speed and HP Ratings
VLR Series Engines and Complete Power Units

	Model	Max. HP	Max. RPM
Natural Gas			
Bare Engine	VLROB	810	1200
Complete Unit	VLROBU	780	1200
Butane-Propane			
Bare Engine	VLROB	900	1200
Complete Unit	VLROBU	867	1200
Normal Diesel			
Bare Engine	VLRDB	830	1200
Complete Unit	VLRDBU	797	1200
Turbocharged Diesel			
Bare Engine	VLRDBS	1135	1200
Complete Unit	VLRDBSU	1091	1200

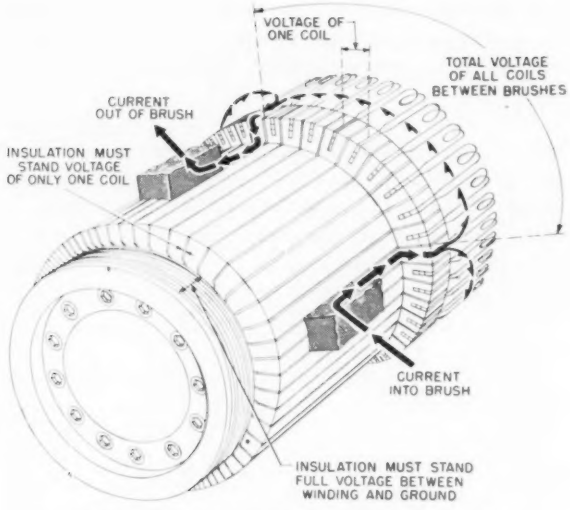

VOLTAGE OF ONE COIL
TOTAL VOLTAGE OF ALL COILS BETWEEN BRUSHES
CURRENT OUT OF BRUSH
INSULATION MUST STAND VOLTAGE OF ONLY ONE COIL
CURRENT INTO BRUSH
INSULATION MUST STAND FULL VOLTAGE BETWEEN WINDING AND GROUND

Fig. 1 Some leakage paths and voltages involved.

As equipment changes, maintenance procedures follow suit. This is equally true of cleaning practices; what served yesterday may not suit today. Because cleaning is so important to successful operation and lower maintenance costs, it pays to keep up with current ideas as given here.

Cleaning the Locomotive's Electrical Parts

LIKE other maintenance problems created by railroads' rapid shift from steam to diesel, the cleaning of electrical equipment is an evolutionary process. Those concerned are still learning and searching for the best in materials and procedures. It takes time to study, test, and evaluate these. As in any field where there is insufficient experience and facts, there are differences of opinion.

Cleaning methods and materials change with conditions such as the work load, equipment design. The increased volume of work due to the greater number of units together with older and dirtier equipment requires more elaborate and expensive cleaning equipment than is necessary where only few units are to be cared for.

Design and construction of equipment parts which have been changing rapidly with demands for increased power and performance are also factors. Examples are the change from sleeve to roller armature bearings; the change from Class A organic insulations like paper, cloth, and shellac to Class B combination including inorganic asbestos and mica; and the more current development of Class H insulations for higher temperatures through the use of silicones and other synthetic materials.

Developments in the cleaning materials industry however, are planned to keep pace with these changes. The bucket of solvent and hand brush, although still useful, have been superseded by steam jets, vapor degreasers, and more recently by soft abrasive air blast methods. These, together with an ever increasing line of chemical and mechanical cleaning materials, make a wide field from which to choose. Each is reported to have its good and bad points. Every potential user is obligated to select what seems to suit his needs.

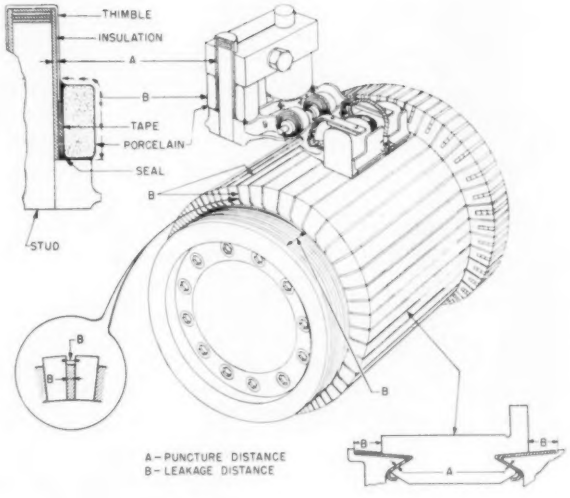


Fig. 2 Brush holder and commutator insulation details.

Approaching the Problem

An examination of the fundamentals is perhaps the best approach. This should enable an interested investigator to better judge what will best suit the needs of his road. The solution may be different as between various points on the same railroad due to varying conditions. Prevention of dust and dirt accumulation insofar as is possible, is of course the best remedy.

Mechanical parts cleaning should be briefly considered first because it is a straightforward process with plenty of background experience on the subject.

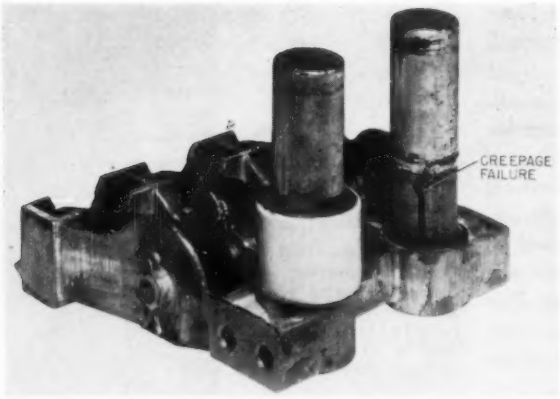
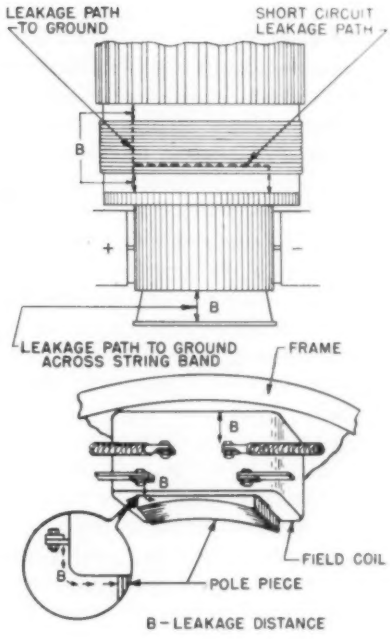


Fig. 3 Creepage failure of brush holder which resulted in tracking and burning of insulating sleeve under the porcelain insulator.

Fig. 4 Typical leakage surfaces on armatures and fields.



Outside surface cleaning, like the main generator and traction motor housings, is recommended as the initial step. This should be done somewhere separated from the repair shop area so as to keep the latter as clean as possible. Various methods used for this purpose include steam jets with detergents; solvents and scrapers, which will remove most of the outside dirt; and abrasive blast methods used for scrubbing off the dirt without the use of water or solvents. Whatever the method, it is a good precaution to keep the inspection covers on and to close off the air inlets. This will keep loosened dirt and/or caustic material out of the machine which might destroy evidence and interfere with finding the cause of defects, or possibly damage the brushes and exposed insulation.

Next comes the pulling of pinions for cleaning and inspection to determine the amount of wear and locate defects. Hot caustic baths, solvents, and abrasives are suitable means of removing gear lubricant. Burning the compound off is practiced at some places, but there is real danger in this because gear life may be shortened through its heat treatment being affected unless burning temperatures are carefully controlled.

After disassembly, of the major parts such as the frame, framehead, armature, and bearings, some shops put all such parts through the same cleaning process. This may not be the best procedure for bearings and brushes.

Usually bearings can best be cleaned individually in a separate room and then immediately dipped in a light oil. If cleaned with other parts in caustic solutions of steam and water, or powerful solvents, and left exposed while other parts dry, it is likely they will rust.

Operating characteristics and the grade of carbon brushes may be altered if put through some cleaners. This is another danger and may be a sizable expense on a larger volume basis as many incoming machines have a considerable number of brushes with wearing life remaining.

The gear case is also important. The same cleaners used to remove lubricant from gears may be used to clean the case, with supplementary hand scraping as necessary to remove hardened compound. The practice of using fire to burn out old compound is likely to lead to distortion and warping.

On reassembly, trouble may be experienced with leaks from bad fits and damaged seals, possibly endangering the gearing and messing up the trucks. The felt rubbing seals at the hubs should always be renewed at time of overhaul as cleaners strong enough to remove gear lubricant will destroy these seals. Another must is the renewal of the fill opening lid gaskets.

Electrical parts cleaning is more complex and subject to more controversy and differences of opinion. Most of the cleaning headaches are concerned with the insulation of the machines. Insulation is a must and it has to be cleaned without being damaged.

When this comparatively thin insulation is damaged in any way, the operating voltage is very likely to burst through, like steam or water through a weak pipe wall, and cause a failure. That is why periodic high potential (hi-pot) tests are made to seek out these weak places if any, and thereby perhaps prevent a service failure.

Insulation is liable to puncture when it has been impaired by soaking or overheating. Mechanical damage is usually due to a blow being struck cutting through or by

rubbing through insulation due to vibration of loose parts. Aside from taking reasonable care, there is not much a maintainer can do about insulation puncture.

Other aspects of insulation, however, are very much the concern of the maintainer and point up the need for adequate cleaning. These have to do with the leakage or creepage surfaces of the insulation system. All electrical parts cannot be covered and enclosed with insulation. Brush holders, brushes, and commutator are exposed as they must make moving contact. Around such parts, the insulation is laid back for a considerable distance. This separates the exposed part from the nearest escape point by a wide surface and air space. It is then difficult for electricity to jump across this space.

Fig. 5 Destruction of commutator string band and damage to mica insulation resulting from a flashover.

Leakage and Creepage

Typical examples of insulation surface leakage is shown in Figs. 1, 2, 3, and 4. These broad insulation surfaces may be likened to a broad shallow stream, too wide to jump across, but by dropping or throwing out a few stepping stones into the stream, one may walk out on them and place more stones until a crossing may be made without jumping. A clean insulation surface is the broad stream and particles of dirt collecting on the surface are the stepping stones. When enough dirt collects, electricity begins to leak across and escape.

At first this leakage is only a little trickle. Tiny winding sparks might be seen as electricity moves between the dirt particles. But do not underestimate these tiny sparks. Magnification shows them to be vicious and hot like a welder's arc. These arcs begin to burn and char the insulation. This in turn makes a better path and allows more and more current to flow until complete breakdown of the insulation occurs. The entire power of the machine breaks through the fault in a damaging blast, unless of course the ground relay comes to the rescue first and cuts the power off.

The nature of leakage across insulation is worth understanding well. It is the chief reason for cleaning so as to remove the dirt bridge and restore the insulation to its proper value.

An examination of the nature of the dirt commonly found on insulation surfaces around railroads will show it to be mainly in the form of dust. It is composed of carbon from soot, smoke, and brushes; iron from brake shoes and wheels, magnetic, therefore is attracted by and clings to magnetic parts of electric machinery; copper and considerable sand also are found in dust. These substances account for 80% to 90% of the dirt. Most of these materials are very good conductors of electricity and make good escape paths for electricity over insulation surfaces.

When electricity flows through a film of water it is interesting to note that as the moisture evaporates from the path, the water film separates into islands. Electric current appears first as a twinkling spark between drops of water. As the space between drops gets bigger, the electric arc is drawn out and begins to char the insulation.

Extent of damage will depend on how fast the water dries up compared to how fast the current burns into the insulation. Where drying is so slow that a track is burned across the insulation, it may be necessary to remove machine from service. This is the reason for first drying a wet machine and measuring insulation resistance before applying a hi-pot test.

Locomotives must operate through all kinds of roadway and weather conditions. Contamination caused by dust, water, oil, fumes, and soot, assume four general forms on locomotive electrical equipment as follows:

1. Dust which when dry can easily be blown from smooth surfaces.

2. Dust soaked with moisture is more compact and makes a better escape path for electricity. The water bridges the space between the dust particles. It seeks out cracks and pin holes in the insulation where dry dust alone would not penetrate.

3. An oil deposit on an insulation surface collects dirt so that it sticks and forms a thick muck. Generally this oily muck can be best removed by washing with a suitable solvent, in some cases perhaps by blasting with soft pellets of the larger size, like corn cobs.

4. A conducting film, a thin smoke-like deposit of carbon particles which adhere tightly to insulation and cannot be washed off. It is best removed with a soft abrasive blast, using the fine flour-like powders mixed with large quantities of compressed air.

Removing Insulation Contamination

Blowing—A jet of dry compressed air is the simplest method if the dust or dirt is dry. Some means of exhausting the dirt from the area should be employed so that it will not settle again on cleaned surfaces.

Air Curing—perhaps should be mentioned here. Cleaning dirt or particles like slivers of copper hanging to

commutator bar edges or lodged in the undercut following a resurfacing operation, is accomplished by directing a blast of dry air directed at spaces between the segments as shown in Fig. 6.

As the machine is brought gradually from zero to full voltage, small pin points of sparks will show where the jet of air strikes commutator, if small particles of dirt or copper exist at that point. At each step, voltage should be held constant until all evidence of sparking under air jet ceases, then voltage should again be increased.

Washing—is usually the next method considered. The use of a bucket of solvent with a rag or brush for applying is the simplest method. Care should be exercised as much as possible to avoid getting dirt into the solvent bucket. The preferred method is to have one rag or brush for application and another for necessary scrubbing and removal of dirty solvent. This method, however, is adequate only where there is a minimum of work to be done.

Spraying—with solvents is quite commonly used. Compressed air is combined with the solvent through an aspirator and blown against the part to be cleaned. Good drainage of dirty solvent away from the parts being cleaned is important. Some solvents are explosive and some are poisonous. Safety precautions in accordance with local regulations and safety codes should be strictly observed, particularly indoors.

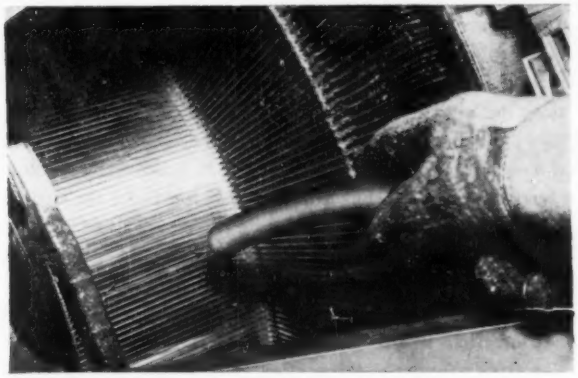


Fig. 6 Air cure commutator by holding end of rubber air hose approximately 1½ in from the commutator and sweeping it longitudinally.

Safety Enters the Picture

Usual procedure is to provide adequate ventilation and keep the concentration below prescribed limits. Where conditions permit, it is best to perform such spraying operations out of doors. Even here suitable precautions to protect operator should be taken such as providing available plastic helmets, with an air hose supplying air for breathing, proper gloves and sleeves to protect hands and arms, along with suitable clothing for the body to keep solvent from penetrating skin.

There are many solvents and cleaners on the market, but the perfect one which cleans without harming the insulation evaporates rapidly without leaving a conducting residue, will not burn or explode, and is not poisonous, has not been found. Of those in use, each has its drawbacks. Carbon tetrachloride, for instance, is an excellent cleaner and was popular several years ago, but as more and more of it was used for cleaning electrical machinery, more and more fatalities were attributed to its use. Today many states have laws against its use for this purpose.

Steam jets combining steam under pressure in a nozzle with suitable detergent solution directed against object to be cleaned, are widely used for cleaning insulation. This method is popular with many railroads. The combined action of heat in steam with the water and detergent work to loosen and remove the dirt.

Various detergents, caustics and soaps are used, all of which should be rinsed or neutralized with clean hot water after removal of dirt. Desirable qualities of a perfect cleaner are the abilities to wet, penetrate, scrub or loosen dirt, emulsify, and yet remain chemically neutral. Each cleaner available has more or less of the various desirable properties, but not one cleaner has them all in equal amounts.

Regardless of the cleaner used, the steam jet method wets and soaks the insulation, therefore a thorough drying out is essential. This is done usually by placing machine in an oven provided with a means of ventilation so that moisture driven off by heat may be carried away. This process usually takes a number of hours. Insulation resistance must be measured periodically as drying proceeds and baking process continued until a good resistance reading is obtained. Ordinarily insulation resistance has a lower value when hot, so some improvement may be expected after machine cools off. If insulation resistance is still too low after cooling, it may be necessary to repeat drying operation provided there is no electrical fault involved.

Insulation having one megohm resistance is generally considered adequate by the electrical industry. New clean equipment may be anywhere from 30 to 100 megohms. Machines in operation may vary from ½ megohm to 100 megohms. The vapor degreaser in competition with the steam jet cleaner has grown in popularity in recent years, with opinions pro and con between the two methods evenly divided.

In these units chlorinated solvents like trichlorethylene or tetrachlorethylene with boiling points at 180°F and 250°F, respectively, are heated to the boiling point in the bottom of a large deep container which is open at the top. The upper edge portion of the container is kept chilled by means of cooling pipes. This keeps the hot vapors from escaping because as the vapors reach this chilled area, they condense and fall back.

When the cold part is lowered into hot vapor, the vapor is condensed to a liquid on the part, dissolving the dirt which runs off with solvent. Fresh clean solvent vapor continues to condense on the part as long as it remains cool enough to cause condensation. The action is intense enough to complete cleaning in a few minutes.

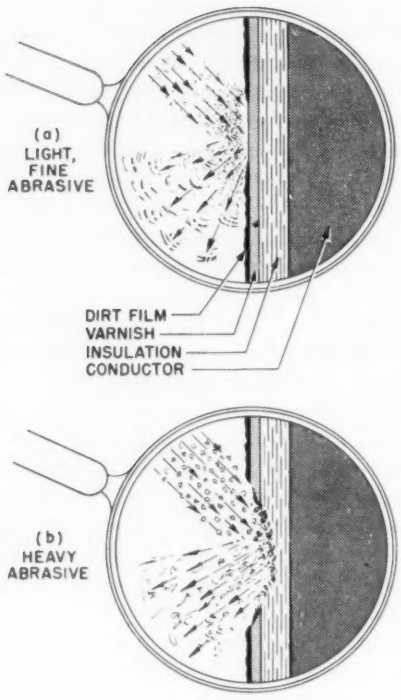


Fig. 7 Good and bad air-blasting practice.

On removal of part from the vapor tank the solvent liquid adhering to it evaporates very quickly. Work may be done on part as soon as it cools enough to be handled. Frequently a dry residue remains after the solvent has disappeared, but this can be blown off with a compressed air jet. Sometimes a dry absorbent material is mixed with air jet to hasten the process.

This operation should be done where a suitable exhaust hood will carry the dust away. This method has the advantage of cleaning the part with a continuously distilled clean solution. However, these solvents are very powerful so that if part is left in the vapor too long, the insulation or some part of it may be removed as well as the dirt. Fortunately, the necessary skill is quickly acquired so that the vapor degreaser method has been firmly established on many roads.

Perhaps it is not a bad idea to remove a little bit of the outside skin of the insulating varnish because a portion of this coat may be cracked and have little particles of dirt embedded in it. Removal of some of the old skin makes room for a new thickness of varnish without building up the varnish thickness excessively.

Abrasive blast methods of cleaning seem to have come into their own while the steam jet and vapor degreaser methods have been competing for first place. In this method, an abrasive powder-like material such as aluminum oxide, sand, or pellets like corn meal, ground corn cobs, walnut shells, and other suitable materials, are entrained in a compressed air blast directed at the part to be cleaned. This results in a sort of scrubbing action. Just as with any other powerful tool, however, the operator must be on the alert to keep out of trouble (Fig. 7). Air pressure and particle size, though, must be carefully selected, as well as the length of application time so as not to damage the insulation.

Heavy abrasive particles driven by powerful air jet will not stop after removing the dirt, but will cut through the protective varnish and rip the insulation to shreds if applied too long. Heavy, soft pellets driven at high speed will pound a surface and while they may not cut, they might loosen the bond between the layers of insulation.

The blasting method of cleaning machinery is now being developed for removing heavy layers of grease and muck. Here the larger particles are probably most effective.

Some Observations

Occasionally a flashover will set fire to the dirt between field coils which may seriously damage the coils. This does not mean that the coils were at fault. If dirt were not allowed to lodge or remain in that location, there would be nothing to support the fire. Therefore in addition to electricity escaping over dirty insulation surfaces, there is also the danger of serious fires. It is another reason for keeping electric machinery clean.

Painting over hard-to-remove dirt on insulation is a strong temptation. It may change the appearance, but it does not alter the resistance of insulation. Electricity will continue to flow through the dirt even though it is under a coat of paint. Painting over dirt makes an eventual cleaning job more difficult. It is far better to let the surface remain dirty until a good cleaning job can be done between trips and completed at another layover. In any event, only thoroughly clean surfaces should be painted.

Prevention is always better than a cure. Anything that can be done to prevent insulation from getting dirty or to reduce the dirt accumulation so that time is lengthened between periods when cleaning must be done, is to be recommended.

Analysis of dirt samples will show where it comes from and helps to determine why dirt does accumulate. This suggests some precautionary action such as better maintenance to prevent oil leaks or exhaust fumes from the engine moving toward electrical equipment and more adequate attention of air filters. In some cases, bulkheads or partitions have been installed between engine and generator, and baffles located so as to direct flow of contaminated air away from electrical equipment.

In conclusion, it may be well to remember that while great strides have been made during the relatively short history of diesel-electric locomotives, there is still a long way to go in developing cleaning materials and procedures. Nor is it a static situation. New designs and new materials constantly being introduced to improve performance will bring about changes in cleaning techniques. One thing does not change—the absolute necessity of maintaining cleanliness.

Special tool retains liner evenly in counterbore, simulating conditions which would exist if head were in place.

Proper Techniques Avoid Liner Troubles

Poor operating practices or improper maintenance procedures can lead to warpage of blocks and cylinder heads. Sometimes attempted cures are as bad as the ailment and lead to a new set of difficulties. Read how these troubles can be avoided.

By Don Smith, District Manager, White Machine Works, Los Angeles

IT is interesting to note that shop men who insist on thorough and proper torquing of engines, especially head studs and nuts, report almost no block distortion that cannot be remedied with emery cloth or a wire brush. Based on the experience of these men, it would seem that a sizable share of current service problems can be eliminated through more attention to the use of a torque wrench.

Still, distortion is found, resulting from either poor mechanical practices or operational conditions. When distortion occurs it will show up in different places and in different ways. A common area for distortion is that surrounding the combustion chamber area. Valve seats may go out of shape, with consequent leakage. As the block distorts it might deform the liner counterbore and affect the liner.

While these conditions can occur with any engine, this discussion will relate to the Cummins diesels. Although specific to them in this case, the principles apply to any engine having similar construction. If distortion occurs in the liner flange counterbores, it is often evidenced by head gasket burning with or without attendant liner "rocking".

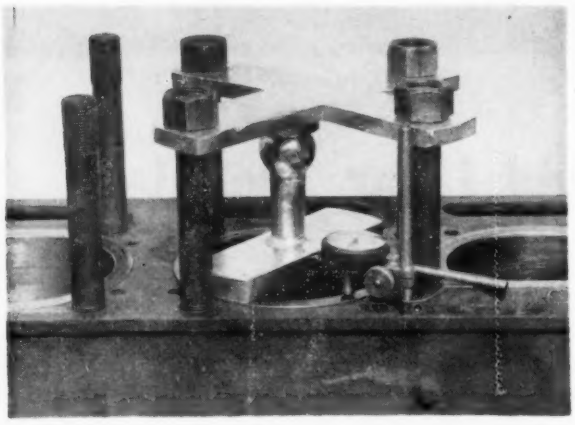
When such conditions are present, it is entirely possible to restore proper geometric conditions using standard parts, the proper tools, and careful workmanship. But if all the necessary precautions are not taken, it is possible to introduce a number of new service problems.

In certain areas, relief from oversized counterbores is being sought through the procurement of liners with extra-thick flanges and/or oversized flange diameters. In other instances shop men are also seeking to hold liners in place more rigidly by using liners with oversized outside diameters in the lower sealing areas. This is not necessary.

If such odd-sized liners come into general use, it is logical to expect serious service problems when duplicates are sought. The resulting delays in material procurement force equipment tieups. Recognizing this possibility, it is obvious that uniform shop practices that will provide satisfactory engine service without odd-sized parts are of value to all concerned. To this end, the following is reported as a summary of the more successful shop methods being used to cope with current liner fitting problems.

Counterbore Depth

It is now generally recognized that a major reason for flange breakage is the installation of liners in distorted counterbores. Correction of the distortion is accomplished by use of a cutter now available to all shops. It stands to reason that the refinished counterbore must be clean and square with the axis of the cylinder bore. If the bore is deepened in the process, further measures must be taken to insure protrusion of the liner above the block as per the original specifications of 0.004- to 0.006-in. This may be done in either of two ways.



Ball and socket arrangement permit even downward pressure on liner, compensating for any slight offset when tightening the top plate. When tightened to the proper torque, liner may then be checked around rim with dial indicator.

Many machine shops upon deepening flange counterbores, plane or grind the surface of the block to compensate. This also raises the compression by a small amount but the practice appears sound. Caution must be exercised however, if both head and block are being resurfaced because excessive removal of metal can result in the piston hitting the injector.

The primary disadvantage of this method lies in the high cost of the necessary precision workmanship. Actually it is only justified when distortion of the mating surfaces of head and block is sufficient to require this operation anyway. While some shops contend that distortion reappears as studs are tightened, it is felt that this goes back to the business of proper torquing.

Unless the surfaces require refacing, a more practical and certainly more economical method is the use of shims as is standard practice with Cummins. Shims are placed between the block counterbore and the lower surface of the liner flange. When properly installed, shims do not seem to create any new service problems.

There is reason to suspect however, that unless shims are fully compressed to allow full heat flow from this portion of the flange to the block that excessive heat at the juncture of the flange and liner proper can cause metal fatigue and contribute to flange breakage. This is especially true where multiple shims are used with a minimum of compression. The lack of pressure in extreme cases can also contribute to liner "rocking". These conditions emphasize why liner flange protrusion must necessarily be exact.

Any variation in flange protrusion produces further harmful effects. Cummins cylinder heads cover two cylinder heads only. If one flange protrudes 0.006-in above the block surface as compared to 0.002-in on the other flange, the cylinder head will place an uneven and diagonal pressure on the flanges. Such side thrust can throw the liner out of line with the crankshaft and in extreme cases, cause the lower portion of the liner to come in contact with the block.

Just as important, uniform head gasket compression is impossible. There seems to be little doubt but that head gasket burning is a direct result of such conditions.

Radial Clearances

There is a difference of opinion in the field regarding allowable maximum clearance between the outside flange diameter and the diameter of the counterbore. The minimum clearance of 0.0015-in all the way around the flange is admittedly critical and accepted, but few shop men agree on an allowable maximum. Some hold that clearances above 0.003-in allow the liner to "work" in the counterbore and cause head gasket failure.

Others cite favorable operation with clearances of 0.005 and 0.006-in—IF—uniform pressure is applied to the flanges. These men contend that flange "working" is also apt to stem from improperly aligned connecting rods, pin bushings, shaft bearings, etc. All in all no evidence has been discovered to indicate that a small amount of extra clearance at this point is harmful when other contributing factors do not aggravate the condition.

In some cases where liner "rocking" is reported, blame is placed on excessive clearance in the lower liner seal

area. The "rocking" condition however, is more apt to be associated with one of the foregoing problems. Proper location of the liner and the degree of restraint is determined at the flange location. When these conditions are correct there should be 0.003-in clearance all around the liner at the lower seal area and the rest of the liner should clear the block by 0.010 in all around.

There are of course, cases where corrosion (principally due to improper cooling system inhibition) and the resulting cleanup will enlarge the lower block seal area beyond tolerance limits. Non-standard liners, oversize at this point, are not a practical solution for the reasons mentioned earlier.

The best remedy for such blocks appears to be to bore or grind the block seal area sufficiently to allow installation of a plain dry sleeve with a heavy press fit. After installation, the sleeve is bored to obtain a true I.D. in line with the original specs. The method allows salvaging of blocks with no danger of heat flow restriction and has the advantage of permitting standard liners to be used.

Measuring

While a majority of shops carefully gauge sleeve protrusion above the block, only a few attempt to hold the sleeve firmly in place while measurements are taken. The usual method is to place the sleeve in the block without sealing rings and while it is thus loosely suspended (it should go in of its own weight), do the miking.

Not infrequently this opens the way for a differing set of conditions when the head is pulled down. For example, if the bottom of the liner flange counterbore is not square with the axis of the cylinder bore, the liner will rest on only one edge or be tilted. Also, when shims are used, such gauging cannot forecast how much change will take place in protrusion of the flange as the heads are tightened.

Recognizing this problem, some ingenious shop men have made tools which hold liners firmly in place while height gauging is done. One such tool is made of heavy steel straps welded together to form an "X". The ends of the "X" are drilled to fit over the studs surrounding a cylinder. To the center of the "X" is welded a socket, usually part of an old steering gear ball and socket.

Another piece of heavy steel is cut to length so that it will extend across the top surface of the flange. The ball portion, with a shaft length sufficient to space the two pieces at approximately the thickness of the head, is welded to this piece. The articulation permits this tool to place an even pressure on the flange when pulled down by the head nuts. Gauging is then done at several points around the flange.

Many shop men have emphasized the necessity of having all engine parts at the same temperature before gauging. They point out that it is not unusual for a delivery truck to bring parts to a shop after exposure to extreme heat or cold, and to have the mechanic make the installation while temperature variations exist between the related parts. Later expansion or contraction of the metal parts, they agree, upsets all tolerances and clearances that may have been established.

All in all, precision shop practices are seemingly more important to good engine rebuilding than the use of specially-built parts when it comes to correction of the foregoing problems.

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 79 to check them.

1. Diesel mine locomotives have long been used in other countries but only relatively recently are gaining acceptance for underground use in this country.
   a. True b. False

2. Nordberg's Supairthermal engines differ principally from other high-pressure supercharged engines in which one of the following design features?
   a. Intercooling c. Variable compression ratio
   b. Higher supercharge d. Manifold design

3. In product pipelines the flow must be sampled constantly at storage and segregation points so as to know when to appropriately divert the stream.
   a. True b. False

4. Automatic and remote starting and control are entirely practical for the smaller diesel units, but large ones are not suitable for such arrangement.
   a. True b. False

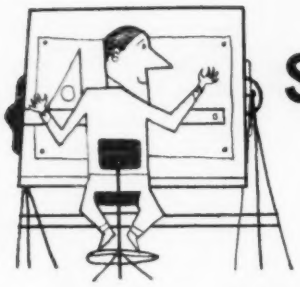
5. Protrusion of liner flanges above the face of the cylinder block is a design feature for—
   a. getting max. pressure at a critical sealing point.
   b. holding the liner firmly in the flange counterbore to avoid "rocking".

6. Liner flange protrusion can be measured accurately by simply inserting liner into bore (without lower seals), placing straightedge across the flange, and using a feeler between straightedge and block.
   a. True b. False

7. Vapor degreasing is a commonly accepted method of cleaning. The process depends on—
   a. the blast pressure of the solvent vapor.
   b. emersion of part in hot liquid below vapor.
   c. temperature of part to permit condensation of vapor on it.

8. The process of removing gear compound from traction motor pinions, gear cases, etc., by burning is not recommended because—
   a. a fire hazard is introduced.
   b. temper of the part may be changed.
   c. warpage and distortion may occur.

9. Which two of the following would you select as most important for instrumentation?
   a. Water level d. Exhaust temperature
   b. Water temperature e. Lube oil pressure
   c. Manifold pressure f. Lube oil temperature

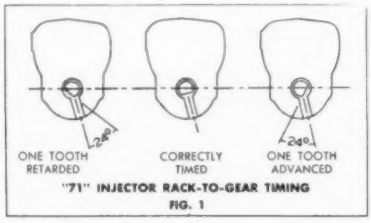


service section

Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you

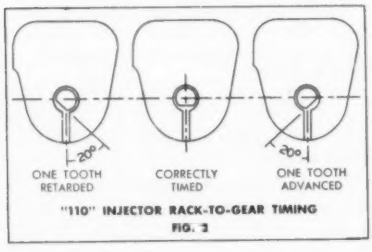
GM—Injector Timing Hint—Series 71 and 110 engines . . .

Whenever it is suspected that the injector is "out-of-time", the hole located 180 deg from the identification tag attached to the injector body may be used to quickly determine whether or not the injector rack and gear are correctly timed.



"71" INJECTOR RACK-TO-GEAR TIMING
FIG. 1

Fig. 1 shows the relative position of the plunger in the "71" injector. It will be noted from this illustration that when the rack is in the "full-fuel" position, the flat side of the plunger is squarely visible in the hole, indicating that the injector is in time.



"110" INJECTOR RACK-TO-GEAR TIMING
FIG. 2

For the Model 110 engine, the flat side of the plunger is also squarely visible when the injector is correctly timed, but for this engine relative plunger position is checked with the rack in the "no-fuel" position.

If it is found that the flat side of the plunger does not come into full view and appears in the advanced or retarded position as illustrated, the injector should be disassembled and rack-to-gear timing corrected.

1-H—Battery Ignition with Electric Starting—Model UD-14A Power Unit. . .

Ignition and electrical system for this unit have been changed as follows:

1. Battery ignition with electric starting now standard equipment, displacing magneto ignition system.

2. A magneto ignition attachment 265 391 R91 is released for factory or field application.

Note: When this attachment is applied at the factory, it eliminates battery ignition and electric starting from the power unit.

3. A magneto ignition attachment 265 392 R91 is released for factory application only.

Note: This attachment eliminates battery ignition, leaving electric starting equipment on the unit.

4. An electric starting attachment 265 393 R91 is released for field application only on UD-14A power units equipped with magneto ignition. This attachment replaces electric starting attachments 252 418 R91 and 252 419 R91.

5. A battery attachment 265 394 R91 is released for factory or field application on power units equipped with battery ignition or magneto ignition with electric starting.

6. Starting primer attachment 253 587 R92 is available for factory application only on power units equipped with battery ignition. The attachment number has been advanced from 253 587 R91 for identification.

7. Starting primer attachment 254 902 R91 is available for field application only on power units equipped with magneto ignition or battery ignition.

EMD—Preparation of Engines for Shipment to EMD for Rebuildng. . .

Engines or crankcases containing a crankshaft being sent to EMD for rebuilding should be properly treated with a rust preventive before shipment. EMD says they have received engines which have not been properly prepared, and as a result crankshafts have rusted during shipment to the extent that the shaft had to be reground to remove rust pit marks.

EMD suggests that a rust preventive be pumped either through the main lube oil system on a complete engine or through the main bearing oil manifold on a crankcase assembly. The shaft should be rotated several times as the rust preventive is being pumped through the crankcase or engine, until rust preventative can be seen running from all bearings.

The importance of using rust prevention measures is emphasized by EMD's experience of finding engines that have been out of service for the relatively short time of 10 days or two weeks which have suffered considerable corrosion damage.

The use of "X-Rust 469 Preventive" manufactured by the Freedom Valvoline Co., or its equivalent, is recommended by EMD for the preparation of engines for shipment.

★ ★ ★

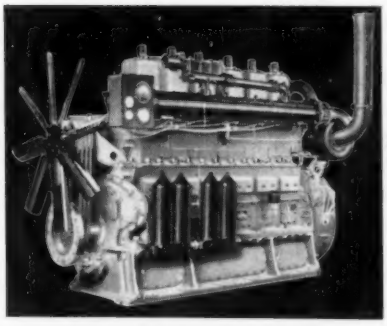
CATERPILLAR—Piston Modifications—All 5¾-in Bore Engines. . .

Both 4-ring and 6-ring pistons currently offered for 5¾-in bore engines have a cast-in iron ring band for the top compression ring. The skirt length of those 4-ring pistons without valve recesses is now 1 in shorter than that of the pistons which they replace.

EXTRA HP at lowest fuel cost!

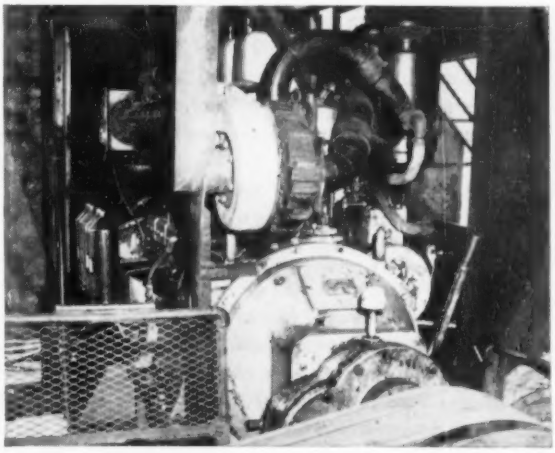
turbocharged WAUKESHA Diesels

Penbrook Contracting Corp., Camp Hill, Pa., uses this 2894 cu. in. Turbocharged Waukesha Diesel powered 5-W Bucyrus-Monighan drag line with 6-yd. heavy-duty bucket and 125 ft. boom for coal stripping and excavating. Penbrook's president, Mr. William E. Crum, says: "One of the best engines we have ever owned." Among the many outstanding characteristics of this big turbocharged Waukesha LRDBS Diesel are lively acceleration, clean burning, prompt starting, a tremendous reserve of power and great overall economy. Send for descriptive Bulletin 1606.



Turbo-Supercharged Waukesha LRDBS Diesel *(left and right)* — 2894 cu. in., 8½-in. bore and stroke; develops 570 hp max. at 1200 rpm; burns all standard "high speed fuels"—powers drag line (top) owned by Penbrook Contracting Corp.

WAUKESHA ENGINES and POWER UNITS 10 hp to 1100 hp



WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.

New York • Tulsa • Los Angeles

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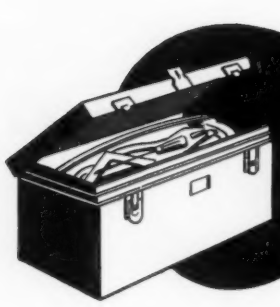


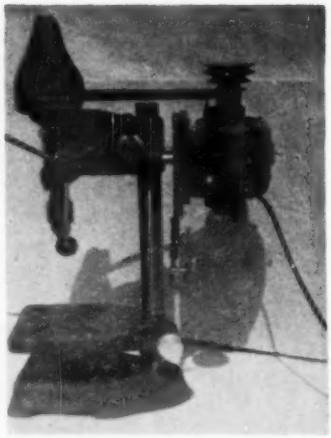
Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

Drill Press Helpers

ARTHUR R. TARRER, Cold Spring, N. Y.—You can't operate a drill press without a chuck key, and cutting oil will not only save your drills but give you cleaner holes. Men will spend time looking for the chuck key because they must, but often the cutting oil can is skipped. I make sure that both are at the machine by attaching them to a convenient spot on the drill press.

The cutting oil can is held in readiness by a spring-type holder. You can drill and tap for a machine screw to mount the holder in the most convenient place that is not in the way of the work. The chuck key hangs freely from a 2-in length of soft ¼-in rubber tubing. The tubing is held in place by a short length of copper wire that is threaded through it and fastened to a handy spot. The handle of the chuck key is slipped into the open end of the tubing and is held there by friction until removed for use by a slight pull. You would be surprised how much time and how many drills are saved by such a simple idea.



A place for everything and everything in its place. Now all you have to do is see that the men put things back again when finished with the job.—Editor

Removing Outer Races or Bearing Cups

PAT MCGWIN, Yelm, Washington—Here is a little trick that I have been using for years that has saved me a great deal of time and effort.

When removing bearing cups or outer races from large castings, it can be a job when they are "frozen" into place. I don't try to pull them but grab the arc welder and run in one or two beads of mild steel around the inside circumference of the stubborn part. In the welding I use as hot a current as possible with the size of the part and rod.

Allow it to cool and you will find that the shrinkage that takes place does the work for you. You will be able to pull the part out by hand.

It certainly sounds like an idea that would work in a lot of places. We would like to inject a word of caution. The application of considerable heat must always be considered carefully. Where close alignment is a factor, you always have to watch out for distortion even in relatively small amounts.—Editor

Holding Gaskets

OLIVER R. POWERS, Ralston, Wyoming—I notice that every once in a while you have an item on methods of holding gaskets in place when installing engine parts. So far, no one has come up with the idea that I use all the time with good results, so I want to pass it along in case some fellows don't know about it.

I use the thin-edged clamp-type paper clips with faces about 3-in wide. Four of these will usually hold the gasket in place while you get some of the bolts or cap screws started. Once enough of these are in place, they will hold the gasket in place so that it can't get away and you are all set. The paper clamps let you work pretty close before you need to take them off.

This idea works well wherever there is a protruding edge such as at the bottom of the block, on crankpans, side covers, etc. Even with grease or sealing compound, gaskets tend to slide, but these clips have enough tension to hold them in place until the bolts are caught.

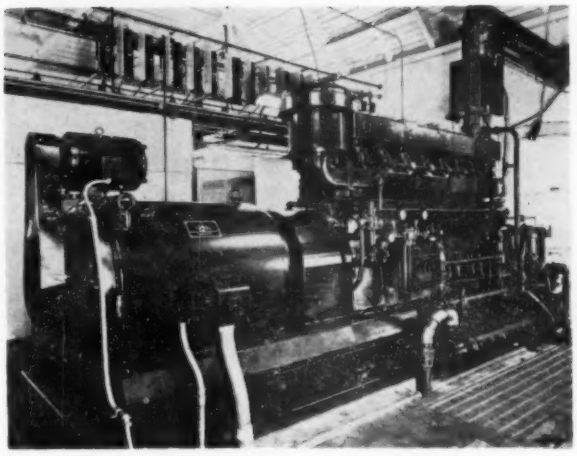
"Bulldog" clips are the stationers' name.—Editor

news of our industry

Diesel for Attleboro

Complete independence of nearly 50-year-old steam-powered pumps was achieved recently by the city of Attleboro, Mass., when a diesel-driven generator was installed for standby service at the water works. The 435-hp engine, driving a 300-kw generator, gives ample power for all pumps during occasional failure of utility power, which is normally used for pumping. Normal water requirements of the city's 24,000 people, including fire protection, are now assured without interruption.

The standby unit comprises an 8-cyl Superior Model 40-S-8 diesel operating at 900 rpm and driving an Ideal generator. In event of a local power outage, the engine is started manually and put into service by the operator on duty. After it is brought up to speed, the main water pumps are put into operation. In addition to the pumps, this standby power operates engine accessories and provides building lighting.



New Plant for H.O. Penn

Approximately 1500 people, including state, county, and town officials, were on hand to witness the opening of a new plant at Westbury, Long Island, by the H. O. Penn Machinery Co., Inc.

The building is of the most modern design for servicing construction equipment, and covers 40,000 sq ft on a 4¼-acre plot located on Stewart Ave. just west of Post Ave. Special cutaway exhibits of a Caterpillar engine in operation, the new oil-type clutch, final-drive and pinion, full-flow lube oil filter, master pin, track roller, and sprocket, were arranged in the showroom.

All sizes of Caterpillar tractors, rubber-tired scrapers, and tractor-shovels were on display in the service shop area. Outside were many other pieces of equipment including Bucyrus-Erie shovels and cranes, Bros rollers, Athey loaders, John Deere farm equipment, and others.

new products . . . . . Page 64

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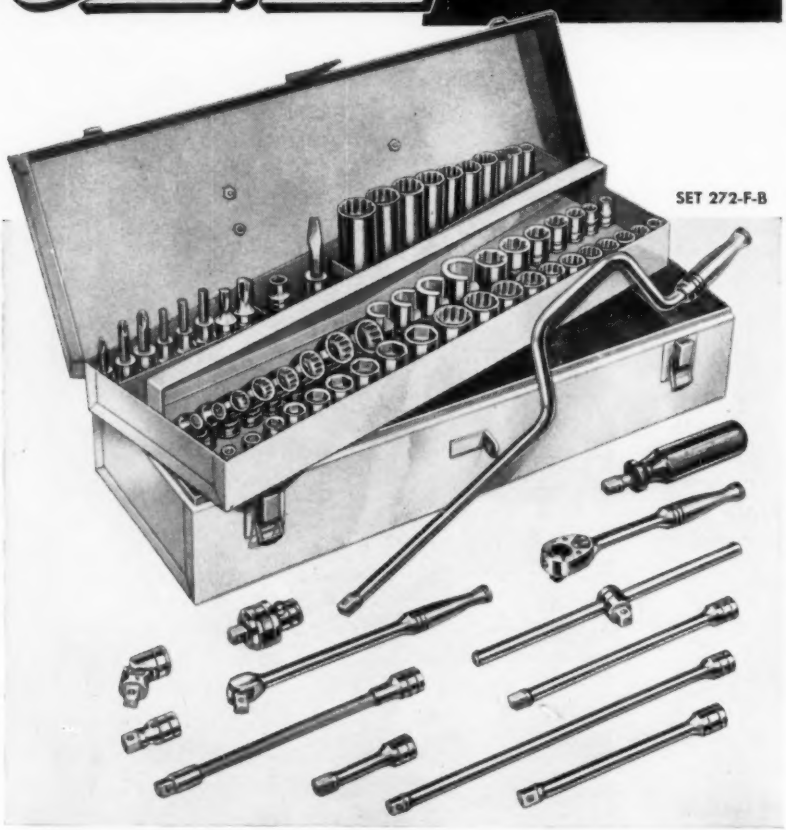
organizational news . . . . . page 70

Slim-fast-versatile

Snap-on* Ferret Wrenches



—for top speed in tight spots

Here is one of the most adaptable, time-saving wrench kits you can put in the hands of maintenance or production workers—a complete set of Snap-on's famed Ferret wrenches. The set includes all handles (⅜″ square drive), adaptors, extensions and sockets (¼″ to ¾″), to speed a wide range of jobs. Handles are long, slim, strong, with patented "Palm-Grip" for real working comfort. 4-way socket grip for quickest handle hook-up. Available through your nearby Snap-on factory branch. Write for Snap-on Industrial catalog and general catalog of 4000 hand and bench tools.

SNAP-ON TOOLS CORPORATION

8064-K 28th Avenue, Kenosha, Wisconsin

*Snap-on is the trademark of Snap-on Tools Corporation.

news of our industry

Continuously Operating Engine

Pumping problems that were formerly encountered by the Union Oil Co. in the rugged terrain of the Torrey lease south of Piru, Cal., have been solved by modification of its 11 International-Harvester U-2A engines to operate continuously. Conversion is said to have resulted in a 33% savings in maintenance costs.

Engines now have an automatic oil level regulator which feeds new oil into the crankcase from a 50-gal drum. Fuel for engines is provided by waste gas, while water for the radiator is obtained by condensing the vapor in the exhaust gas. The engines now operate without attention for 6 mo. During recent inspection of an engine that had operated for more than a year, only repair made was the replacement of plugs.

Cooper-Jarrett Buys 72 GMCs

General Motors' Truck and Coach Div. recently announced purchase by Cooper-Jarrett, Inc., Chicago, of 72 DFM660-47 highway tractors. The trucking concern is said to be the first one to place the new hydramatic models into service on a major scale. They are rated at 60,000 lb. GCW.

In taking over the first new units, Guy D. Cooper, executive vice president of the line, said that in his opinion trucks with automatic transmission would make those with regular transmission obsolete. "With faster shifting going away from stop lights and up hills," he said, "we figure we can cut three hours off our Chicago to New York schedules." As an example of the gear-shifting a driver has to do, it was found that on one 300-mi stretch of highway a driver executed 600 shift sequences averaging as many as 8 to 13 individual shifts per sequence.

news of our industry

Ductile Iron Conferences

A series of conferences designed to acquaint engineers with the properties and applications of ductile iron has been inaugurated by The International Nickel Co., Inc. Individual meetings are being held for companies employing cast or wrought components.

The first two of these conferences have been held at Worthington Corp. and M. W. Kellogg Co. Discussions have centered around mechanical properties, design, manufacturing, specifications, heat treatment, applications, and service performance.

Ductile irons are a family of cast metals first produced commercially in 1949. They are said to have the processing advantages of cast iron combined with the engineering advantages of steel. Not subject to size limitations, ductile iron castings have been produced in intricate shapes and in weights varying from 2 oz to 100,000 lb, with section thicknesses between 1/10 in and 48 in.

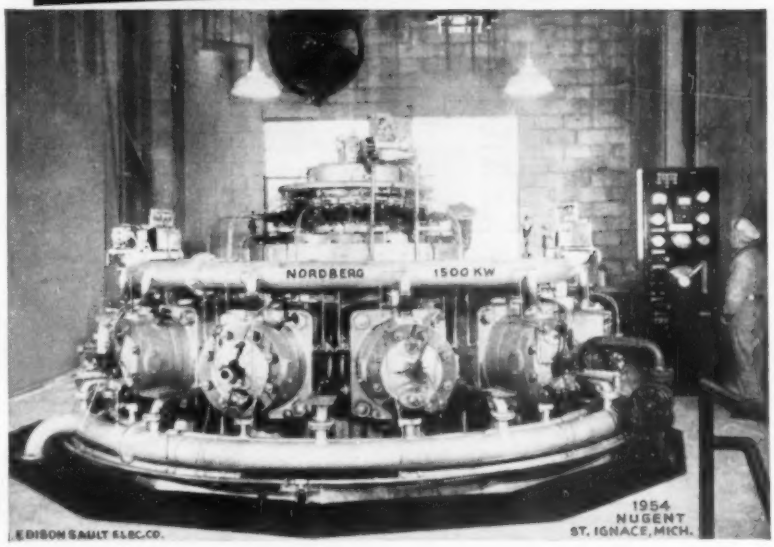
LMOA Discusses Diesel

The Locomotive Maintenance Officers' Assn. has scheduled a series of "convention at home sessions" to review outstanding reports presented by its technical committees. Aim is to receive ideas and suggestions on the problems in open floor discussions which will later appear in proceedings for the benefit of all members.

Schedule for November through January, 1955 is as follows:

Nov. 9, Buffalo, N. Y.: "Increased Use of Welding, Metalizing, and Chrome-Plating for Reconditioning of Diesel Parts"; Nov. 9, St. Louis, Mo.: "Diesel Truck Maintenance and Methods of Reducing Flange Wear"; Nov. 11, Detroit, Mich.: "Proper Cleaning and Testing of Diesel Electrical Equipment"; Nov. 16, Louisville, Ky.: "Diesel Rewiring and Restoration of Insulating Values"; Dec. 14, Jacksonville, Fla.: "Training Supervisors and Mechanics in Diesel Locomotive Maintenance"; Jan. 24, Denver, Col.: "Uniform Flow and Handling Material in a Centralized Diesel Shop".

Nugent filters selected as original equipment at St. Ignace power plant



Shown in the view above is a 1500 kw Nordberg Radial Diesel installed by the Edison-Sault Electric Co. for municipal power service at St. Ignace, Michigan. Included as original equipment on this diesel was a Nugent Duplex Fuel Oil Filter of the type that removes 99.8% of all foreign solids from the fuel supply. The St. Ignace installation is still another example of Nugent filters being selected as original equipment by a leading diesel manufacturer.

Nugent duplex fuel oil filter of the type used on the new diesel at St. Ignace. Bag type recharges are inexpensive and simple to replace.

Nugent filters are available in a wide range of sizes and types to meet every need. Size for size they provide 20 times more filtering area than any other filter. Full or by-pass filtering is possible with the same unit and simple piping makes installation easy. These are some of the reasons why leading diesel manufacturers specify Nugent filters as original equipment.

To assure longer life and better service from your own diesel, investigate the possibilities of Nugent filtering. Write today for complete information.

NUGENT TRADE MARK

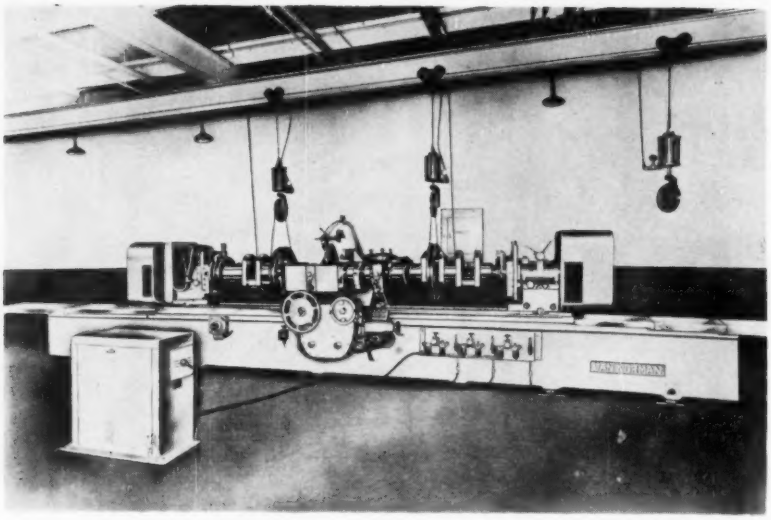
Wm. W. Nugent & Co., Inc.
417 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Established 1897

Representatives in Boston • Cincinnati • Detroit • Houston • La Junta, Colo. • Los Angeles • Minneapolis • New Orleans • New York • Philadelphia • Portland, Ore. • San Francisco • Seattle • St. Louis • Tulsa • Representatives in Canada: Montreal • Toronto • Vancouver

new products



Crankshaft Grinder

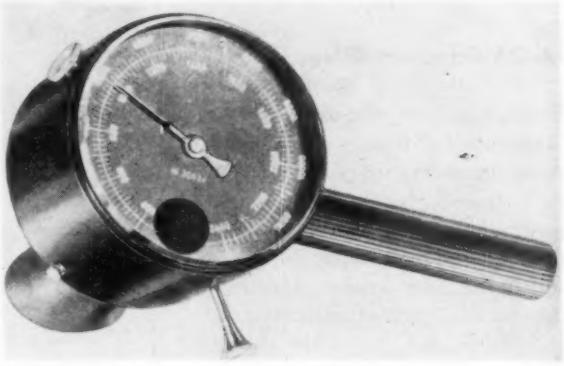
A new crankshaft grinder designed for use in the locomotive field was recently introduced by the Van Norman Co. of Springfield, Mass. Known as the No. ELW-36x167, it has a 36-in swing and space between centers of 167 in.

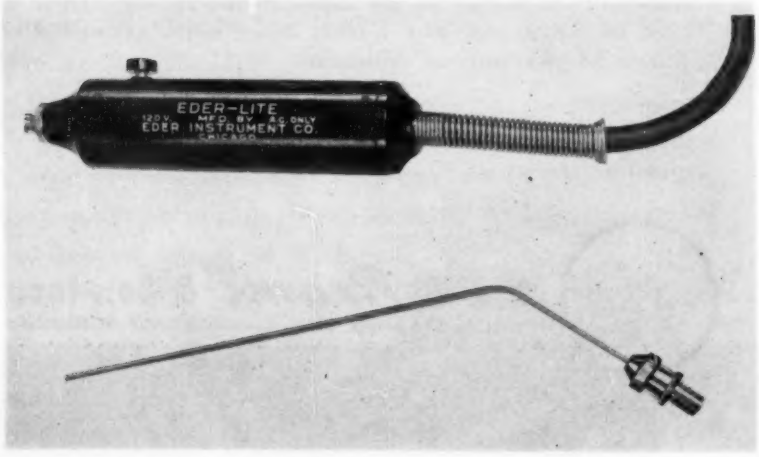
Photo shows a typical installation. The DC converter and control box is located on the floor in front of the machine. The rheostat for workhead control is located on the bed of the machine to the left of the gear box. Details available from the company, Springfield 7, Mass.

Hand Stroboscope

Epic, Inc. is currently marketing a light, handy portable instrument for measuring revolutions and for visual observation of all fast periodic motions. Called the Askania stroboscope, the instrument is held by hand and does not require electrical connection as it is operated mechanically by a spring movement.

In spite of its simplicity, the instrument has an accuracy within 1%, according to the manufacturer. Its range is from 400 to 12,000 rpm. Complete information is available from the company at 154 Nassau St., New York 38, N.Y.





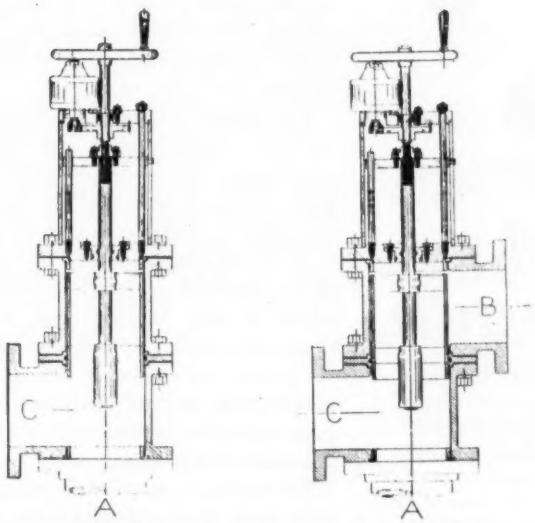
Inspection Light

Eder Instrument Co. has introduced a new inspection light with an extension designed to fit in small openings or crevices. The "grain of wheat" bulb is only 1/8-in maximum diameter, and the stem of the extension shaft only 3/32-in diameter, which allows free movement in a 1/8-in opening. Other extensions, 1-in to 36-in long, flexible or rigid, fit the same unit. For complete information, write Dept. 4, 2293 N. Clybourn, Chicago 14, Ill.

Thermostatic Valves

Amot has announced production of 3-way diverting or mixing valves and 2-way shutoff or throttling valves in a wide range of sizes. In actual operation of the 2-way, a pneumatic controller is mounted with the thermostatic bulb at the point at which the temperature is to be maintained. In most applications, according to the manufacturer, the bulb is mounted in the line going to the "A" connection.

With an increase in temperature, there is a corresponding decrease in the pressure released by the controller to the operating mechanism, which starts the air motor, causing the sliding valve to move upward and close off the "B" opening.



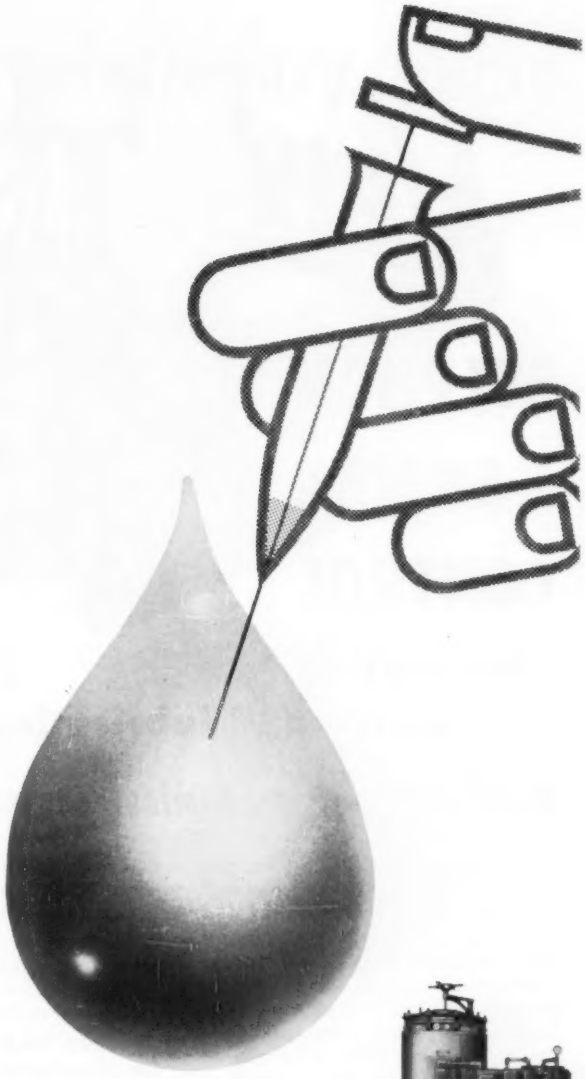
AMOT MODEL E
2 WAY Shut Off or Throttling Valve

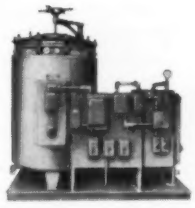
AMOT MODEL D
3 WAY Diverting or Mixing Valve

On the Model D or 3-way valve, opening "C" will open up as "B" closes. A reverse action can also be supplied in which the sliding valve will move upward with a decrease in temperature. A valve positioning mechanism is built into the control to assure that the valve position will accurately correspond to the temperature.

Valves are constructed of cast iron and bronze fitted. No packing adjustments are necessary since O-rings are used in place of stuffing boxes. The controller makes use of an Invar rod and phosphor bronze is used in its valves and valve seats. Controller body and other parts are on brass.

Sensitivity of the unit is adjustable so that the temperature range required to move the sliding valve from one extreme position to the other can be adjusted from 50°F to 40°F. With the sensitivity set for a 40°F range, for instance, the sliding valve will be just starting to move upward at 130°F and will be all the way up at 170°F. Detailed information is available from the Amot Controls Corp., First St. and Nevin Ave., P.O. Box 1707, Richmond 1, Cal.





new life for old oil
with the
HOFFMAN OIL CONDITIONER

This combination cartridge filter and vaporizer not only filters out organic acids, resin, gums, asphaltenes and other oxidation by-products . . . but also eliminates fuel dilution and soluble moisture.

Widely used by Diesel owners in the pipeline, power and transportation fields . . . it saves time, labor, space, often pays for itself in a short time *in lube oil savings alone.*

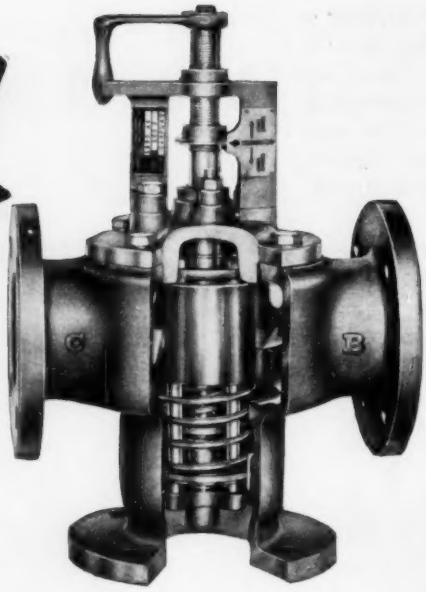
Find out how this compact, lube oil restorer fits into your operation by calling on HOFFMAN'S Filtration Engineering Service for a free survey. A wide range of stationary or mobile units with flow rates from 25-600 G.P.H.

For more detailed information on the new HOFFMAN OIL CONDITIONER write for Bulletin #974 and Case Study #6.

Industrial Filtration Division
U. S. HOFFMAN MACHINERY CORPORATION
DEPT. D. P., 105 FOURTH AVENUE, NEW YORK 3, N. Y.

NEW

SYLPHON ENGINE CONTROL



for cooling water and lubricating oil

More efficient, economical engine protection

THE new Sylphon Engine Controls Nos. 1280—1281 are three-way valve regulators especially adapted to control temperatures of cooling water and lubricating oil on internal combustion engines with increased efficiency and less maintenance. Each stage in design was completed only after consultation with leading engine builders to assure that the most exacting engine control requirements would be met.

Stable temperature is assured by use of the newly-developed and proved pressure-insensitive, powerful, dependable fusion-type thermal elements. Control No. 1280 (pictured above) is provided with a quick-acting manual operator which may be used to override the thermal element to open and close the valve—No. 1281 does not have manual operator. Over-temperature protection standard for both regulators.

Compact, Self-contained, Self-powered. Controls operate automatically. No auxiliary source of power required.

Easily Serviced . . . Reduced Maintenance. Entire operating mechanism can be easily removed from the valve body without breaking pipe connections.

Operating Temperatures—Factory set for any specified operating temperature between 120° and 190° F.

Pressure Limit—Suitable for pressures up to 150 psig. Valve is completely balanced.

Sizes—2" to 6", inclusive.

Superior Construction and Finish. All valve bodies are bronze with flanged ends (150 lb. MSS or 100 lb. Navy). Springs are monel. Other parts are of brass and cadmium plated steel. Sturdily built to serve for years.

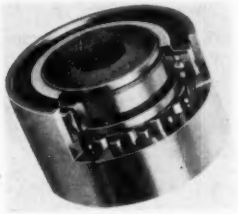
For more information about these new Sylphon Controls, write today for Catalog VD-817.

Robertshaw-Fulton

CONTROLS COMPANY

FULTON SYLPHON DIVISION • KNOXVILLE 1, TENN.

new products



New Cam Clutch Line

Morse Chain Co., 7601 Central Ave., Detroit 10, Mich., is announcing a new line of cam clutches designated Series HT. The self-contained units include dual-drive and 2-speed applications. They have a single-row ball bearing to help maintain concentricity of inner and outer race.

The clutches feature constant pitch spacing, alternate cam and roller construction for accurate operation. Their shape causes them to avoid cam roll-over under peak or torsional loads. If the ultimate torque capacity of the clutches is exceeded for a short period of time, the unit acts as a torque-limiting device and slips without galling the outer race. When the condition is removed, the cams become operative again and assume their unloaded position.

To facilitate attachment of machine drive details, tapped holes are in one end of the outer race of the clutches. A bearing shield is provided which also retains the clutch lubricant. The clutches can be supplied for either right- or left-hand drive and are made in three standard models with both standard and custom-made keywayed and set screw bore sizes.

Sweat Soldering Paste

Alpha Metals, Inc., 56 Water St., Jersey City 4, N.J., is selling a new solder paste for sweat soldering or tinning. It consists of a blend of 50/50 powdered solder and active flux. Paste is applied with brush or cloth, the parts fitted together, and heat applied. After heating, residue can be removed by wiping with a damp cloth.

Joints obtained are said to be as strong as those from conventional methods using a separate flux and solder wire. Product comes in ½-lb and 1-lb cans along with a free brush.

new products

Hard-Facing Alloy Rods

For general hard-facing applications where wear- and corrosion-resistance are required, Wall Colmonoy Corp., 19345 John R St., Detroit 3, Mich., is offering a new chrome-cobalt-tungsten hard-facing alloy. Called Walloy No. 6, the new alloy comes as a hard-facing rod for oxy-acetylene torch application. It is claimed ideally suited for applications such as on engine exhaust valves and seats.

The alloy is said to provide high impact and abrasion resistance. It resists oxidation and does not readily heat-check under pressure at elevated temperatures, and is claimed virtually unaffected by most common corrosive chemicals or by atmospheric corrosion. It also will resist chipping and spalling and has some ductility, retaining these qualities at red heat. Deposits can be machine ground to a high finish.

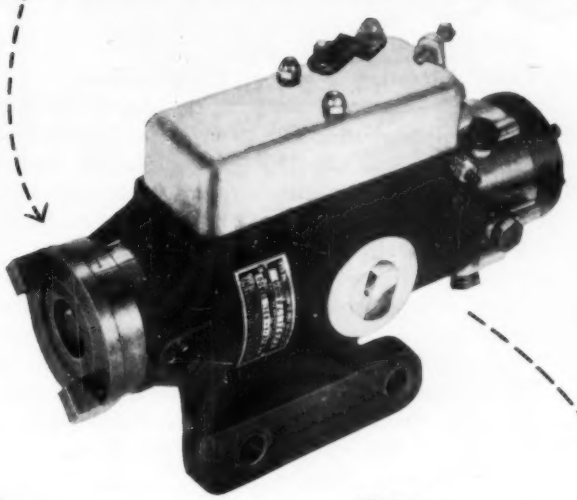
Gauge Block Set

An 84-block gauge set said to contain all accessories necessary for a complete gauging system has been introduced by Webber Gage Co., 12899 Triskett Rd., Cleveland 11, Ohio. Claimed to be accurate to within plus or minus four millionths of an inch, the set is designed to meet requirements of precision product manufacturers.

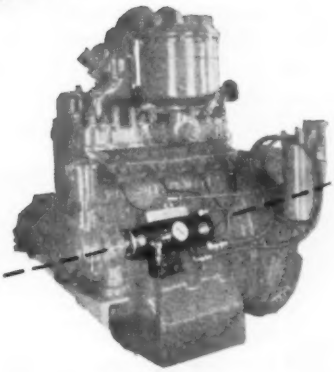
It contains fixtures which will assemble the blocks for use as dividers, scribers, and height or snap gauges, in addition to normal gauging functions. The fixtures have no screws so as to enable gauging surfaces to remain free of obstruction. Individual blocks are ½ in by 1½ in, can be assembled to almost any desired length,

and complete assembly becomes a single gauging block.

this revolutionary pump



makes good diesels better!



Perfected after 15 years of research and intensive field experience, the Roosa Master is a revolutionary development for better and simplified fuel injection. Performance-proven... simple... compact and lightweight, Roosa Master offers to both diesel engine manufacturers and users such advanced features as: built-in governor that gives extremely close speed regulation, built-in transfer pump, complete self-lubrication... plus the elimination of complicated springs, poppet valves, ball bearings and gears. Not limited on high speed applications and easy to service right in the field, Roosa Master pays big dividends (to your diesel customers) in high performance, low maintenance cost, and long life. For the very best in diesel engine performance, specify Roosa Master, made by one of New England's leading manufacturers of precision machined products. Complete information is available from the Hartford Machine Screw Company, Hartford 2, Conn., or your engine manufacturer.

ROOSA MASTER

THE MODERN FUEL INJECTION PUMP

new literature

Diesel Lube Oil Filtration

The necessity of efficient and dependable filtering of lubricating oil is pointed out in "No Short Cuts to Safe Filtering", a new booklet published by Caterpillar Tractor Co., Peoria 8, Ill. A step-by-step discussion of what a filter must accomplish and how a filtering system serves the engine is included.

Pressure Water Demineralizer

Barnstead Still & Sterilizer Co., Lanesville Terr., Forest Hills, Boston 31, Mass., has published a detailed bulletin of its pressure bantam water demineralizer which delivers demineralized water under pressure for piping to any desired location.

Description is given of the ion-exchange process and how ionizable impurities are removed. Application details are also contained, including use for storage battery maintenance.

Gas Purifiers

Its line of Deoxo process instruments for the catalytic purification, hydrogenation, and oxidation of gases, is presented in a 6-page folder by Baker & Co., Inc., 113 Astor St., Newark 5, N. J.

The various instruments are claimed to offer practically complete removal of oxygen, carbon monoxide, or hydrogen, with no maintenance expense and very little operating expense. Applications and specifications are given.

Hose Couplings

Catalog No. 6500 issued by the Le-Hi' Div. of Hose Accessories Co., 2700 N. 17 St., Philadelphia 32, Pa., details its line of quick-acting hose couplings for various service applications and illustrates how the couplings can be used with its line of air valves for control of compressed air.

Hydraulic Oil Filters

The Hilliard Corp., West Fourth St., Elmira, N. Y., has issued an 8-page bulletin on the use of its oil filters for all hydraulic systems.

Described in detail are construction and operation of hydraulic systems, with special emphasis placed on contamination of hydraulic fluids and how this condition can be eliminated. Diagram drawings indicate methods of installation on various types of circuits. Tabulated listings are given of Hilco model and size filters for various capacities. Typical installations are illustrated.

Tachometer Bulletin

Just issued by Herman H. Sticht Co., 27 Park Pl., New York 7, N. Y., is Bulletin 1406, which describes in condensed form its five different kinds of tachometers: centrifugal and chronometric type hand tachometers, hand tachoscopes, centrifugal and cable-driven stationary tachometers, and portable and stationary vibrating reed tachometers. Specifications are included.

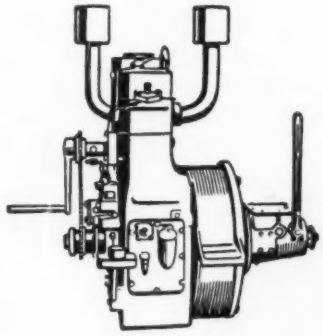
YOU BET YOUR LIFE . . .

on the dependability of your lifeboat power. Recent submersion tests in New York harbor offered demonstrated proof that the BUKH Diesel runs smoothly and efficiently, and develops full power even while completely under water.

BUKH four-stroke cycle lifeboat Diesels are available in three sizes with outputs of 10, 20 and 30 horsepower, at 1500 r.p.m.

BUKH Diesel

There is a BUKH 4-cycle full diesel tailored to suit your requirements for marine or land, stationary or mobile power. Fifty years of diesel experience is behind their outstanding dependability and economy.



BURMEISTER & WAIN AMERICAN CORPORATION

Write for details

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17 Battery Place, New York 4, N. Y.

For FUEL TRANSFER and HYDRAULIC GOVERNOR Service

TUTHILL

MODEL L PUMPS ARE PERFORMANCE-PROVED

Throughout the diesel industry, Tuthill Model L pumps are recognized for their dependability in fuel transfer and hydraulic governor service. Model L is a mechanically-sealed, positive displacement internal-gear rotary pump, assuring quiet, leak-free operation with low power consumption. Capacities from .33 to 6 g.p.m. in wide pressure ranges. Available as single or double-pump units. Write for Catalog No. 101 including Pump Guide for diesel applications.

TUTHILL PUMP COMPANY
Dependable Rotary Pumps since 1927
939 East 95th Street, Chicago 19, Ill.

Canadian Affiliate: Ingersoll Machine & Tool Company, Ltd., Ingersoll, Ontario, Canada

KIENE®

DIESEL

indicator valves

OPERATES AT PRESSURES UP TO 10,000 PSI

Kiene valves have effective gas seal both open and closed without packing or glands. Operate against pressure — will never blow open. Small and rugged — 4¼" in length with only 3¼" circle of space for attachment. Kiene valves give better service under the most severe conditions. Standard indicator plug and wing nut connection.

Furnished with male ½" NPT engine connection. Other threads on order. Adaptations for most diesel locomotive engines.

SEND FOR BULLETIN V-10

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

new literature

Bulletin for Pyrometer Users

"Alnor Pyrometer Accessories" is the title of a new bulletin issued by Illinois Testing Laboratories, Inc., 420 N. La Salle St., Chicago, Ill., said to be available in limited quantity.

Specifications and performance data for Alnor thermocouples of every type and application are covered. Also included are notes on thermocouple alloys, temperature-millivolt relationship curves, a listing of industrial applications, and a temperature conversion table.

Pressure Filters

The Permutit Co., 330 W. 42 St., New York 36, N. Y., has released bulletin No. 2225B, describing its line of pressure filters and their accessories for removing suspended solids from water. Specifications, operating characteristics, outline dimensions, and typical installation photographs are included.

Machine Tool Attachments

South Bend Lathe Works, 425 E. Madison St., South Bend 22, Ind., has a new attachment and accessories catalog offering full specifications on its complete line of machine tool attachments and accessories. Subject matter covers precision toolroom and engine lathes (9-in through 24-in swings), turret lathes, drill presses, 7-in bench shapers, and 8- and 10-in pedestal grinders.

Aluminum Extrusion Study

Prepared by Harvey Aluminum, 19200 S. Western Ave., Torrance, Cal., is a comprehensive study of aluminum extrusions. Purpose is to point out the uses to which they can be applied in new design, and to aid those now using the extrusion in improving existing design.

Technical material covered in the 26-page text includes current applications, design advantages, fabricating, finishes, and general characteristics. Charts, illustrations, and sketches are used throughout.

Titanium Bibliography

To help industry keep abreast of latest advances in titanium technology, the Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C., has published a 26-page listing of government titanium research reports that are now available to industry.

More than 300 research reports are described and priced, with complete instructions for ordering. Special listings feature alloys, carbides, nitrides, and various oxides. Research described covers all characteristics of the metal: physical, chemical, and electrical. Price of the listing is 50c.

Tank Caps and Filler Necks

Engineering data on its standard line of caps and related necks for various fluid tank installations are contained in a 12-page booklet released by Eaton Mfg. Co., Stamping Div., 755 E. 140 St., Cleveland 10, Ohio. Blueprints of all stock numbers are available upon request.

organizational news

C. Lee Cook Sales Engineer

Announcement has been made of the promotion of Clarence T. Duke to the position of sales engineer for C. Lee Cook Mfg. Co. His territory will include Michigan, Wisconsin, Indiana, and Kentucky, with headquarters in Louisville.

Mr. Duke has been with Cook for 18 years. Prior to this appointment he had served in the production, purchasing, engineering, and design departments.

Clarence T. Duke

Alco Sales Manager

Richard K. McCoy has become southern district sales manager for American Locomotive Co. to replace Col. W. G. Lockwood who has retired. Mr. McCoy will make his headquarters in Washington, D. C.

Enterprise Executive

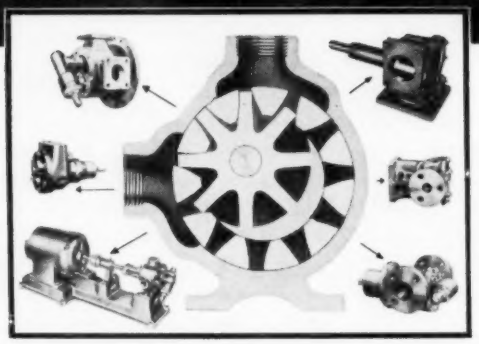
General Metals Corp. has made known the appointment of William Clausen as executive vice president of that firm and general manager of its Enterprise Engine & Machinery Div.

Prior to this appointment, Mr. Clausen was vice president and general manager of Sangamo Electric Co., Ltd. of Canada. He had previously held top management positions with leading capital goods manufacturing companies.

Enterprise is currently introducing engine models in power capacities exceeding 5000 hp. Heretofore its engines have been up to 2700 hp.

William Clausen

SAVE *with* VIKING ROTARY PUMPS
BUILT TO FIT YOUR JOB!



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This is the principle that assures fast, self priming; smooth even discharge; quick, easy mounting; low power requirements; adaptation for either light, volatile liquids or heavy, viscous liquids.

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Hard Chrome deposited on crankshafts by "Rotary Process" adds new shaft life. Shafts electro heat treated 3 times.
Camshaft lobes reground to original lift.
All parts carefully magnafluxed to detect hidden defects.
Experienced Workmen — Specially Designed Machinery — Careful Inspection, guarantee each job.

Crankshaft Capacity
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Camshaft Capacity
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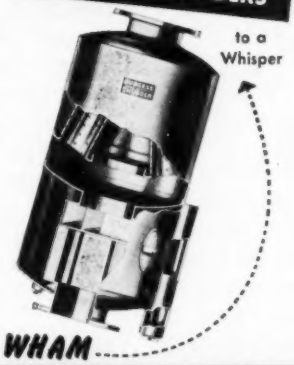
with BURGESS-MANNING Spark Arrester EXHAUST SNUBBERS

Noiseless, smoother, safer operation are prime specifications of every Burgess-Manning Marine Snubber. Every one is engineered to the specific problem of maximum engine performance by completely dissipating the energy of exhaust gas slugs — therefore, quiet efficiency.
Every one is built to render lasting satisfaction under severest conditions. There are no obligations for recommendations—send us a description of your problem.



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From a WHAM

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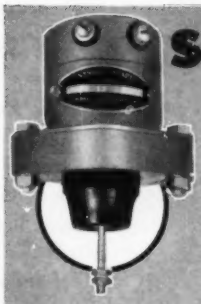

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Also available with the protecting boot is a SYNCHRO-START Solenoid with the standard aircraft A N Connector (Model SS-AB).

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organizational news

Exide Elevates Managers

Promotion of two sales executives has been announced by the Exide Industrial Div. of The Electric Storage Battery Co. Charles H. Leet has been transferred to the firm's Chicago office as assistant branch sales manager. R. L. Kegg has succeeded him to the post of sales manager at the Pittsburgh office.

Mr. Leet joined Exide in 1938 as sales engineer in the Pittsburgh branch and was appointed manager there in 1949. Mr. Kegg first became associated with Exide in 1951 as Pittsburgh branch sales engineer, which post he leaves for his new position.

Penn Controls Director

The new position of director of manufacturing for Penn Controls, Inc., has been given to George S. Myers.

Mr. Myers will be responsible for all manufacturing activity and will participate in development of public relations and employment policies. He has been associated with Perfect Circle Corp. for the last 10 years, serving as works manager since 1948.

Caterpillar Advancements

Charles A. Woodley has been appointed vice president of Caterpillar Tractor Co. and four promotions have been made in the company's Peoria plant, according to recent announcements. Lloyd J. Ely is the new plant manager, Gordon Swardenski is manager of manufacturing, Cary L. Ice is the new assistant manager of manufacturing, and Robert E. Gilmore has been named manager of the engine factory.

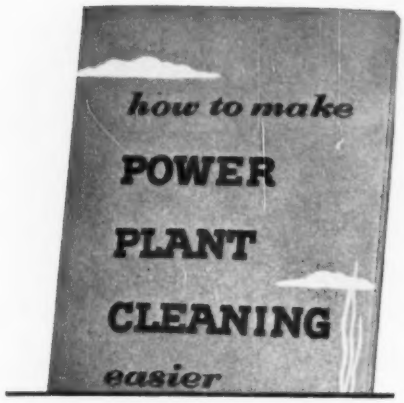
Mr. Woodley began his career with the company at the age of 16 as a machine shop apprentice. He then advanced to lathe operator, foreman, general foreman, supervisor of industrial engine assembly, assistant general factory manager, and was named manager of the Peoria plant in 1953.

C. A. Woodley

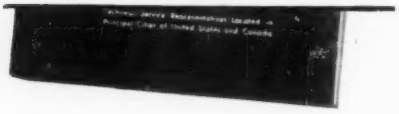
L. J. Ely

Mr. Ely joined the company in 1916 as a tool chaser. He became a machinist, general foreman, assistant superintendent, assistant factory manager; works manager and vice president of Caterpillar's Decatur plant; and in succession, manager of engine factory, assistant general factory manager, and manager of manufacturing at Peoria.

Mr. Swardenski, who has been assistant manufacturing manager for the past 15 months, began with the company in 1930 as a machinist apprentice. Mr. Ice, who has been manager of the engine factory in Peoria for the past four years, began working for the company in 1928 as a machine operator. Mr. Gilmore, who joined the company in 1938 as a machinist apprentice, has been assistant manager of the engine factory since 1951.



Your Guide To Diesel MAINTENANCE CLEANING



Here—in this new Power Plant Cleaning Guide—you will find one money-saving suggestion after another to help speed up your diesel overhauling and reconditioning work. Here, for example, are described the most modern, most effective procedures for:

- **Soaking hard carbon deposits off aluminum pistons**
- **Removing rust and scale from diesel cooling system**
- **Cleaning filters**
- **Desludging lube oil coolers**
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And saving time and money on many other important maintenance operations.

A FREE copy of this informative booklet will be mailed promptly on request. No obligation. Write Oakite Products, Inc., 22C Rector Street, New York 6, N. Y.

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organizational news

Aeroquip Promotes Two

The advancement of two engineers on the staff of Aeroquip Corp. has just been announced. Kent R. Manning now occupies the post of factory manager and Robert W. Bowman that of chief industrial engineer.

Robert W. Bowman

Mr. Manning will direct plant operations and the methods and standards, production control, and purchasing departments. He joined the company as chief development engineer in 1952 and before that worked on the guided missile program for the U.S. Army.

Mr. Bowman will now serve as industrial engineering consultant for the company and its subsidiaries. He was chief of methods and standards for the Kawneer Mfg. Co. before he joined Aeroquip in 1953 in the same capacity.

Kent R. Manning

Permatex Dedicates New Plant

As a major step in its $750,000 expansion program, Permatex Co., Inc., producer of sealing compounds and maintenance chemicals for the transportation industries, has formally opened its new plant in Kansas City, Kans. It will double the company's present production facilities, according to C. A. Benoit, Jr., 31-year-old Permatex president.

The new plant will be entirely staffed by employees from the immediate area. Supervisory personnel only, headed by William C. Hean, general manager, will be transferred from the home plant in Brooklyn.

A 160-ft by 180-ft structure, the new plant has two levels of manufacturing area, utilizing gravity to minimize pumping of compounded chemical products. An 18-ft high warehouse area has also been included in the building. The new facilities will be used for expanded volume manufacture of major products such as hydraulic brake fluid and sealing compounds.

Burgess-Manning Manager

Under a new sales organization plan, H. A. Dietrich has been named manager of the Chicago district of Burgess-Manning Co. The company's sales organization now consists of three primary districts: Chicago, New York, and Dallas.

Heading the Dallas district is S. G. Paddock, who also directs and correlates the complete sales operation. W. A. Carroll, Jr. is the manager of the New York district.

National Supply Distributors

The Engine Div. of The National Supply Co. has appointed two distributors. For the state of Maine, Harris Co., Inc., Portland, has been named distributor of Lister diesels. R. B. Richardson, Detroit, has become distributor in Michigan for Superior, Atlas, and Lister diesels.

Detroit Diesel Distributor

W. R. Bays, former Kansas sales representative of the Detroit Diesel Engine Div. of General Motors Corp., has been appointed the distributor for GM diesel engines in western Kansas. He has taken over facilities of the former distributor, Diesel Equipment Co., and will continue business at the same location and under the same firm name.

Prior to taking over his new enterprise, Mr. Bays served the division as both service and sales representative. He was assigned to the Kansas territory in 1949.

W. R. Bays

news of our industry

Automatic Yard Switching

An electronic device developed for directing guided missles now directs freight cars on the Union Pacific. Developed jointly by the railroad and Reeves Instrument Corp., the system automatically switches and controls the coupling speeds of freight cars. It is considered a major advance in pushbutton railroading.

Called "electronic yardmaster", the system is expected to practically eliminate impact damage to boxcar lading resulting from errors in human control in retarder yards. The pilot system now in use provides for routing to eight tracks, but the completed project will control all 42 tracks at the line's North Platte, Neb. retarder yard which handles as many as 4000 freight cars in 24 hr.

A string of freight cars is pushed up over the hump of the yard, and as the cars are uncoupled and start down the incline to tracks of the yard, switching and control of speed is done automatically. Control towers operate braking devices on the tracks to regulate speed.

Rolling characteristics of cars are measured by radar, by which the system determines retarding speed for safe impact point at the required coupling distance. Everything is done automatically; all the control operator does is select the tracks for which the cars are destined.

PIE Buys 103 Diesel Trucks

Pacific Intermountain Express recently announced purchase of 103 new over-the-road power units at a cost of $1,300,000. Eighty-three of the units were bought from International Harvester and the other 20 are now under construction by General Motors' Truck and Coach Div.

The new JT-6 Cummins diesel engines, with turbochargers, power the Internationals. Hydramatic transmission is featured in the GMC DFM660-47s. The new tractors have air springs and sleeper cabs. They are for operation on the company's routes east of Denver to improve shipper service, replacing the driver relay system now being used there.

...a handful of lost horsepower

Would you buy diesel engine or turbine lubricating oils containing this kind of "gooey" mess—and expect the oil to give peak performance? Obviously no, yet users of Sharples oil purifiers in one day, often remove many times this amount of abrasive particles and water from their oils—at low cost, and without harming or removing additives.

Dirty oil costs money—in extra wear on moving parts, lost efficiency, and short service life. A Sharples oil purifier keeps oil at maximum lubricating efficiency at all times; it takes only ten minutes to clean, and requires practically no maintenance.

If you are operating diesel engines, it will pay you to take a good look at the extra savings and extra earnings that a Sharples oil purifier makes possible year in and year out. Write for Sharples Bulletin 1264.

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news of our industry

Trailmobile Repurchase Plan

Trailmobile Inc. is offering truck-trailer operators, who are hesitant about investing in a new trailer until they are certain about an uptrend in business, a 90-day bonded agreement.

Under the guarantee, an operator may purchase a used trailer in the last quarter of 1954, and if he decides in three months that his business justifies the purchase of a new trailer, he can apply the full net purchase price of the used trailer on a new one by returning the used trailer for credit. If business is slow next spring, he will have only a low investment in a used trailer with no heavy fixed charges to meet.

New Theory on Train Wheel Slip

General Electric Co. announces it has uncovered a new theory for the slipping of locomotive wheels, one of railroad's oldest problems. It has isolated the cause and is now studying the remedies.

The theory holds that slipping is caused by an extremely thin, practically invisible layer of oil approximately one molecule thick, which spreads itself over the running band of a rail at the onset of rain or when there is dew. Despite its thinness, this layer can withstand pressures so high (up to 75,000 psi) that locomotive wheel loads ordinarily used will not break through it.

Accumulations of journal oil can be observed outside the wear band at many places on track. When the rails become moist or damp, the oil spreads, pushing the water off the rail. This oil, used in the bearings of freight cars, contains some percentage of animal oils. One drop of oil, in the presence of moisture, has ability to cover a surface of five square meters and if tracks were not interrupted by joints, this one drop would spread for a distance of 2 mi.

It is believed that if the source from which the film spreads is removed, moisture will no longer cause slipping. Railroads have long observed that rails which look satisfactory would lose adhesion upon introduction of moisture. But if rain continued, adhesion would be restored. However no satisfactory explanation was found for this. The new theory points to washing of rails, possibly with a detergent.

Cleaning methods now under investigation in addition to water and detergents, include solvents, open flame, and ultra violet light. If a suitable cleansing agent is found, much of the sand currently used on locomotives to improve traction on wet days can be eliminated. Added benefit would be a reduction in drag time of the train.

Fiat RR Diesels to Argentina

Fiat Grandi Motori, Turin, Italy, has designed a new series of 4-cycle rail traction diesels to meet requirements of locomotives constructed in Argentina. The Italian firm is supplying 80 engines, designated Type 288 ES, which have a 1-hr rating output of 1200 bhp at 750 rpm. The new engines have Woodward governors and utilize Brown Boveri turbochargers.

ROCKFORD CLUTCHES and POWER TAKE-OFFS—with constantly improved design—have controlled power transmission satisfactorily in trucks, tractors and road machinery during the past third of a century. Their smooth, reliable, trouble-free operation has caused them to be specified as original equipment for scores of different makes. It will pay you to investigate the competitive advantages that ROCKFORD CLUTCH exclusive features will give your products.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD CLUTCH DIVISION
BORG-WARNER
1301 Eighteenth Avenue, Rockford, Illinois

ROCKFORD CLUTCHES

news of our industry

Specialized Diesel Locomotive

General Electric Co. has shipped the Allied Chemical and Dye Corp. a specially-built diesel-electric locomotive for use in its Kentucky by-product coke plant. The locomotive has no windows on one side of the cab to help protect the operator from the heat of incandescent coke. The cab side has also been cut down to provide needed clearance in close places.

Shown here, the locomotive is a 25-ton, 150-hp, diesel-electric, specially equipped with an extra large compressor, extra air reservoir capacity, and air dumping equipment for a coke quenching car.

Tax Limits Rebuilt Unit Part

"Where only part of an automotive unit is rebuilt (i.e. machined, remetalized or rewound for resale), excise tax is to be based upon the wholesale price of the rebuilt part and no longer upon the price of the entire unit."

The above quotation is from a bulletin issued by Halfpenny and Hahn, attorneys for the Industry-Wide Committee for Removal of Discriminatory Automotive Excise Tax of the Automotive Engine Rebuilders' Assn., based on new rulings issued by the Treasury Dept. It was given in reply to questions left unanswered by the last ruling.

In reply to other questions the bulletin reveals, "The Treasury Dept. states that it considers reaming of engine, shock absorber, brake or windshield-wiper cylinders, to be a major operation comparable to reboring or machining, so as to be taxable when performed upon parts being processed for sale.

"However, it does not consider the honing of any such cylinders, nor the filing of armature commutators, nor the insertion of tax-paid pre-formed coils in armatures, to be operations comparable to reboring, machining, or rewinding. These processes do not give rise to excise tax when performed upon parts being processed for sale."

New York Seeks Engineers

Fifty-five assistant mechanical engineers are being sought by the city of New York, at a starting salary of $5006 a year. Typical duties consist of work of "moderate difficulty and importance" in connection with installation, inspection, testing, operation, maintenance, drafting, or detailing of mechanical equipment for schools, rapid transit railroads, movable bridges, public buildings, sewage disposal works, ferries, and other municipal works.

Minimum requirements are a bachelor degree in engineering and three years of practical experience, or a satisfactory equivalent. Applications will be issued and received up to Nov. 22 at the Dept. of Personnel, 96 Duane St., New York 7, N.Y. A $5 fee is charged.

HOW

TO STOP "little troubles" from causing ENGINE BREAKDOWN

Yes . . . little troubles such as overheated cooling water or lube oil pressure failure can develop anytime in any engine. But, let them go undetected and serious engine damage coupled with lost productive time can occur. That's the big reason *your engines need Penn Safety Controls!*

Here's the protection you get! At the first hint of overheated water or oil pressure failure, the Penn Control will sound an alarm, flash a warning light, or stop engine operation . . . *whichever you choose.* Then, you can investigate and correct the little troubles *before* damage occurs. Learn more about this *low-cost* protection. Write **Penn Controls, Inc., Goshen, Indiana.** Export Division: 13 E. 40th Street, New York 16, N. Y., U.S.A. In Canada: Penn Controls Limited, Toronto, Ontario.

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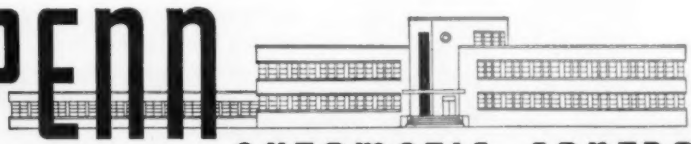

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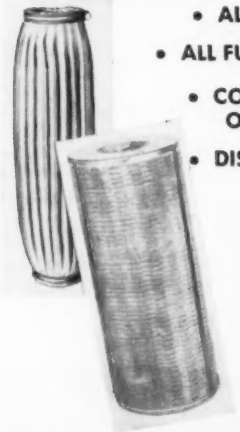

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news of our industry

Clark in Torque Converter Line

Clark Equipment Co. has announced its entry into the torque converter business with the acquisition of inventories, engineering designs and products, tooling trademarks, patents, and certain other assets of The Torcon Corp. Principal customers for this type of product include manufacturers of automotive and construction equipment, and equipment used for oilfield and logging applications.

In taking over inventories and business-in-hand of Torcon, the company announces it is not purchasing Torcon's capital stock nor assuming its liabilities. It is also not getting Torcon's plant facilities at Ashtabula nor its basic machine tools. Production operations for manufacture of the torque converters will be transferred to Clark's transmission plant at Jackson, Mich. A number of key personnel from Torcon have joined Clark to continue their activity in this field.

Transportation Forecasts

Intercity freight traffic will pass the two trillion ton-mile mark by 1975, or almost double the present figure, according to Richard L. Bowditch, chairman of the Chamber of Commerce of the United States. He made the prediction in an address to the ninth annual meeting of the American Soc. of Traffic and Transportation, recently held in Washington, D.C. He also forecast a 50% increase in intercity travel during the next 20 years.

Basing his views primarily on economic studies made two years ago by the president's Materials Policy Commission, Mr. Bowditch saw the railroads remaining the nation's largest freight carrier, handling about 40% of the total. Trucks, benefiting from road-building programs, will haul about 30% of the total. Water carriers and pipelines will account for most of the remaining 30%, with airlines handling less than 1% of the estimated freight total.

Private cars will remain the predominant mode of passenger transportation. Airlines will become the principal commercial carrier. Railroads and buses will build up their passenger travel by about one-third. The most radical change in travel will probably be in the regular operation of helicopters.

By the end of the next 20 years, some atomic-powered locomotives will be in operation, the official stated. However, the diesel engine will then handle more than 95% of rail traffic. He saw fewer short-distance trains operating in 1975, but forecast popular demand for luxury streamliners running at speeds over 100 mph. Speeds of freight trains will also pick up because of improvements, most striking being increased use of electronic devices.

Diesel-Powered Motorcycle

Mr. A. Freeman Sanders, England, connected with various designs of diesel engines used in Ferguson tractors, commercial vehicles, automobiles, and London taxicabs, has converted a Norton 16H-type motorcycle to diesel drive.

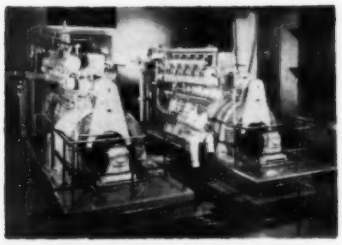
It was originally a side-valve machine, and was converted by use of a new cylinder barrel, cylinder head and piston. A casing to house the camshaft of the fuel injection pump was installed behind the cylinder, its driving chain also rotating the dynamo armature.

Power output after 60 hours of bench running was 16 bhp at 4500 rpm. Starting was accomplished by a Ki-gass pump delivering kerosene plus 10% ether. A later version will have inclined valves in a revised head and an A1-fin cylinder barrel. Compression ratio is 12.8 to 1 and fuel consumption is about 120 mpg as compared with about 70 mpg on gasoline. Maximum speed is about 70 mph.

Westinghouse Buys Schneider

Westinghouse Electric Corp. has announced purchase of all capital stock of the Schneider Mfg. Corp., manufacturer of torque converters. Accordingly, Westinghouse is entering a field that is "a natural adjunct to production of power-transmission equipment," the announcement reveals. Westinghouse's gearing division produces many types of gears, including power transmissions, largely for industrial applications.

news of our industry



Diesel-Powered Sewage Plant

Shown here is the power supply for Tampa's latest sewage treatment plant, the largest in Florida. Two Worthington engines furnish the power for driving Electric Machinery Co. generators. Both engines operate on the sewage gas produced during treatment of the raw sewage.

DEMA Educational Meeting

Its third 1-day educational meeting for the fall of 1954 will be held by the Diesel Engine Manufacturers Assn. at Esso Research Center, Linden, N. J., on November 18. The program will cover a series of talks interspersed with laboratory visits.

Topics for discussion include: railroad fuels of the future, how railroad crankcase lubricants are developed, and the role of greases and specialty products. Guided tours will cover engine testing facilities and special testing equipment such as the electron microscope, and various types of spectrographs and spectrometers.

Optical Research Tool

General Motors' research laboratories announce that they are utilizing a new type of microscope that measures peaks and valleys ranging from 2 to 100 millionths of an inch. Calling it the interference microscope, physicists working on it say it adds the dimension of depth to the examination of microscopic surfaces, a dimension ordinary microscopes cannot measure.

Thus far the microscope has been used to measure plating thickness, leveling abilities of plating materials, and effects of weathering on painted surfaces. It has also been used to control precision roughness standards used throughout industry to standardize machined surfaces of bearings, cylinder walls, piston liners, valves, and other highly machined, close fitting parts. Another use has been to check corrosion pits and other defects on plated parts and surfaces such as cylinder bores and bearings.

CNR Orders Three More Budds

Canadian National Railways announces it has placed an order with The Budd Co. for three self-propelled rail diesel cars. These are for an RDC-1, 89-seater; RDC-2, 70-seater; and an RDC-4, to be operated as a baggage and mail train. The railroad now has three RDCs in operation.

SAE Diesel Engine Meeting

Techniques of starting diesel engines in arctic weather and of supercharging the power plants for greater power, featured the Soc. of Automotive Engineers' national diesel meeting recently held in Cleveland. Among speakers were Rear Admiral W. D. Leggett, Jr., chief, Bureau of Ships, Navy Dept., who discussed "Some Future Diesel Possibilities". Participants toured General Motors' Cleveland Diesel and Euclid plants and the Collinwood shops of the New York Central Railroad.

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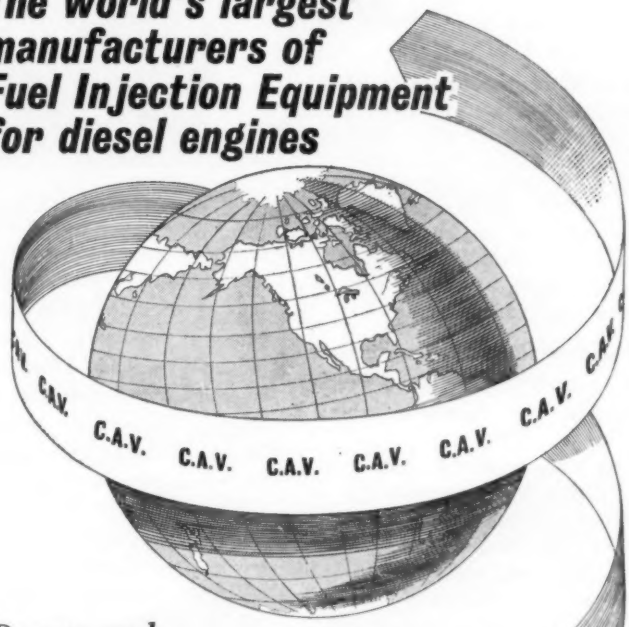

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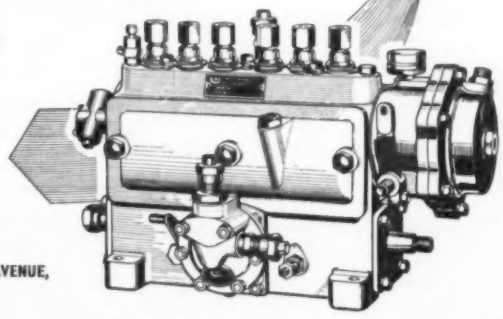

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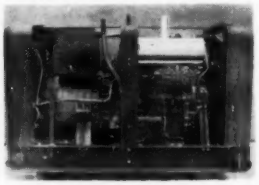
ILLINOIS TESTING LABORATORIES, INC.
Room 507, 420 N. La Salle St., Chicago 10, Illinois

new products

New Kittell Silencer

A silencer which doubles as a manifold has been developed by Kittell Muffler and Engineering Co., 915 S. Santa Fe, Los Angeles, Cal. Designed at the request of Salyers Equipment Co. for use on its generator set powered by a DIX 6D Hercules 6-cyl diesel engine, the new muffler is said to save weight and make a smaller and more compact generator set possible.

No manifold is required; the silencer is mounted directly to the engine block by means of a flange. Interior of the silencer has the same louvre design as the company's standard. Operation is as follows:



As exhaust bursts enter the chamber, they are directed through louvres along the outer shell which cools them and reduces their volume. More louvres direct the gases back into the center of the silencer and out into the atmosphere. This design is said to smooth out pulsations and produce a steady, whisper-like exhaust flow. Large, free-flowing passages are claimed to prevent plugging due to excessive carbon or sludge deposits.

The new silencer is made of stainless steel for lighter weight and resistance to corrosion, and is welded throughout.

New MoS_2 Powder

Molykote-Microsize, a new grade of molybdenum disulfide powder, is being made commercially available by The Alpha Corp., 65 Harvard Ave., Stamford, Conn. Reduction of particle size is the main feature.

Military specifications for the compound permit particle sizes up to 149 microns. Molykote Type Z, which has been available from the company for some years, has particle sizes not exceeding 64 microns. The new product's average particle size is less than one micron.

Advantages of the new lubricant are pointed out by the company in several examples. In a cross section of a ground bearing surface, for instance, with a finish of 8 micro-in, the majority of surface crevices are 0 to 4 microns wide and up to 1½ microns deep. The new lubricant will fill these crevices. When dispersed in liquids or greases, it is able to enter between surfaces to be lubricated. Economically too, the lubricant has better surface covering ability than those with larger-sized particles. The company calculates this to be 15 times greater than its Type Z powder.

Rust Remover

Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Cal., has developed a rust-removing material said to simultaneously strip paint, rust, and primer from ferrous metal surfaces. Called Rustgon, the liquid alkaline material requires just two steps—a dip and a pressure rinse.

Parts to be de-rusted are immersed into a hot tank containing the material, withdrawn, and then rinsed with air and water or with steam. No need for pre-cleaning or after-neutralizing is necessary and the compound is claimed to decrease re-rusting. It is said to remove slightly pitted rust in less than a minute, heavy rust and multiple coatings of paint in a few minutes. The product is used without dilution, and requires no mixing.

On-the-Spot Battery Charging

Leece-Neville Co., 5109 Hamilton Ave., Cleveland 14, Ohio, announces a newly designed alternator charging system for on-the-spot battery charging. The complete rig consists of the alternator, a rectifier, and a regulator, and is said to be easily installed in a conventional service vehicle to replace standard generator.

Two cables are permanently attached to the service vehicle's rectifier. Clips with shields are on the other ends of the cables, which are attached to the discharged battery of a disabled vehicle. With the service car's engine at fast idle, the system produces about 80 amps and in 5 or 10 min, the discharged battery is able to work (providing it was not originally dead).

What Do You Know!

(*Answers to Questions on Page* 57)

1. Correct answer is "a". Use in Canada and Europe has been much more prevalent. Bureau of Mines has approved and trend is now growing. See Page 39 for description of such a unit.

2. Correct answer is "c". This feature is unique to the Supairthermal engines. For example of results obtained, see the article on Page 42.

3. "b" is correct answer. Statement is not entirely true since modern control methods permit practically automatic handling. See article above.

4. Again "b" is correct answer. Two examples of such control arrangements applied to large engines are given in articles on Pages 30 and 42.

5. Both "a" and "b" are correct; both functions are performed, fortunately, and both are important. Sealing is a problem at diesel compressions and the liner must be retained at the flange if the lower end is to be free to expand. Discussion appears on Page 55.

6. Correct answer is "b". "a" is a common practice but results are not necessarily accurate. For reasons see article mentioned above.

7. Correct answer is "c". Cool parts permit continuing condensation of clean solvent on part until its temperature is raised above the vapor's dew point. For a discussion of this and other cleaning practices, see article on Page 50.

8. "b" and "c" are certainly correct and "a" may be a factor unless precautions are taken. Better cleaning methods are discussed in the article mentioned above.

9. While all indications are useful, "b" and "e" are the principal indicators of common engine malfunctioning. To see how these may be applied for engine protection, see article on Page 45.

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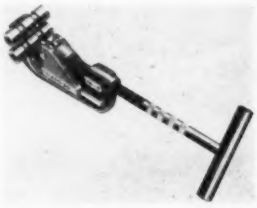
new products

6-Roller Pipe Cutter

Toledo Pipe Threading Machine Co., 1431 Summit St., Toledo 4, Ohio, has introduced a heavy-duty pipe cutter, specially designed with six rollers to prevent spiraling when used with power drives. Capacity is 1/8- to 2-in pipe.

Features claimed to save time and improve performance include easy-



to-see cut-off mark, true alignment of rollers to assure square cut-off, perfect tracking, and sturdy malleable frame to fit the hand. The high alloy steel cutter wheels are said to leave practically no burr.

Rust Preventive

American Sand-Banum Co., Inc., 9 Rockefeller Plaza, New York 20, N. Y., announces development of "Rustend", said to be an effective rust arrester and preventer for use on all metals new or old. It is a transparent liquid that polymerizes upon drying into a film that acts as both a rust-proofing primer and coating for new metals, and a touch-up compound for rusted surfaces.

In the case of new metals, adhesion is enhanced by weathering or etching. The product can be flowed, dipped, sprayed, or brushed and will set in about 3 hr, drying hard in 24. Where rust has started, wire-brushing of loose scale from surface is necessary. It is said to have storage and dilution stability, and weather and water resistance.

Pocketknife-Type Allen Wrench

Hunter Tool Co., Whittier, Cal., is manufacturing a larger "Smitty" pocketknife-type wrench to accomodate five sizes of Allen head fittings. Coded the P5L, the new tool has keys ranging from 3-in to 5-in length. Fitting sizes are 3/32 in, 1/8 in, 5/32 in, 3/16 in, and 7/32 in.

Servo Analyzer Developed

An electronic system that will permit engineers to estimate the effect of addition of new equipment to an industrial operation without actually test-installing such equipment was recently unveiled by Minneapolis-Honeywell Regulator Co., Wayne & Windrim Aves., Philadelphia 44, Pa. Known as a servo analyzer, it automatically translates behavior characteristics to a chart record which in turn is analyzed to determine how such a component will affect overall behavior of operation.

The result of some 10,000 man hr of research, the new system is said to save 30% to 60% of research time involved in re-designing a process. In operation, the system puts a control, or group of controls, through its paces to see if it performs correctly when specific conditions are altered. This is done by automatically introducing a rhythmic change (similar to AC) into a process. The analyzer then automatically measures and plots the effects. It is said to complete and record an entire test in as little as 8 min.

The system is portable and made up of four components: single generator, portable potentiometer, control box, and function plotter. It provides three forms of test energy: pneumatic, mechanical, and electrical.

Exhaust Muffler

Design of its new Cyclone muffler, developed by The Yale & Towne Mfg. Co., 11,000 Roosevelt Blvd., Philadelphia 15, Pa., is intended to capture carbon particles from the exhaust stream of engines and to eliminate the discharge of ignited solids in exhaust gases.

Centrifugal action is employed to throw solid particles into a collector, leaving the gases free to exhaust. This is said to reduce possibility of ignited exhaust particles as a source of ignition to combustible material. The muffler has been made standard equipment on all the company's diesel-powered trucks. It is of the dry type and is said not to require water or other servicing because of no moving parts.

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Dependable, tight closing by hand pressure under all conditions.

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Valve never needs to be removed from engine for replacement of any parts.

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WRITE FOR BULLETIN 654D

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new products

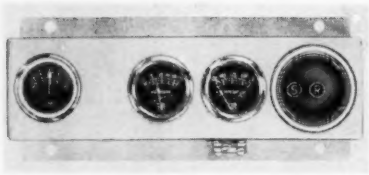
Self-Flaring Fittings

Century Products, 315 S. 15 St., Philadelphia 2, Pa., has announced a complete line of self-flaring, pressure-tight fittings in ¼-, ⅜-, and ½-in sizes, said to eliminate need for pre-flaring the tubing.

No flaring tools are used; the operator inserts tube into the fitting and tightens the nut with an ordinary wrench. The tube is flared automatically inside the fitting, forming a standard 37-deg seat. Mated surfaces of tube and internal flaring cone are claimed to assure a leakproof connection. Tube installation may be formed before assembly, since tubing does not rotate during tightening.

The fittings include male, female, and union connectors, 90-deg male elbows and tees.

For copper tubing, brass fittings are available. They are also made of anodized aluminum, cadmium-plated steel, monel, and stainless.



Safety Panel for Engines

To protect unattended or remote-controlled engines from burned bearings, frozen pistons, or other costly failures, Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14, Ill., has introduced a safety panel consisting of an oil pressure gauge and water temperature gauge in combination with engine shut-off switch, ammeter, stop switch and reset, and 14-amp fuse.

Should oil pressure drop too low or temperature rise too high, the panel automatically shuts off the engine. Minimum oil pressure and maximum temperature is predetermined by "stop" positions on the gauge faces which are tamper-proof and adjusted by a regulating screw behind each instrument. Panel case is 12-in long, 5⅛-in wide, and 2⅝ in from front to back.

Impulse-Duration Telemeter

To transmit and receive long distance measurements of flow, pressure, liquid level, temperature, and other variables, The Foxboro Co., Foxboro, Mass., has introduced an impulse-duration telemetering system.

Designed for applications such as reservoir level, natural gas line flow and pressure, and intra-control systems, the telemeter can handle distances up to 150 mi by wire or may be operated over radio link or microwave channels.

Because the system operates as a function of pulse duration, the signal level is said to be capable of wide variation without affecting operation or accuracy. At 12-sec intervals the transmitter sends a pulse to the receiver, proportional in duration to the variable being measured. The receiver automatically compares this pulse duration to the previous one and actuates a reversible motor which positions a recorder pen to reflect any measurement change.

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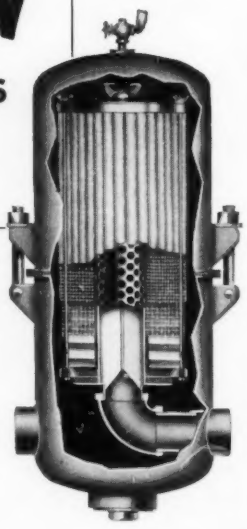

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W. C. DILLON & CO. Inc. 146208 Keswick Street Van Nuys, (suburb of Los Angeles) Calif.

new products

Medium-Duty Steam Cleaner

Livingstone Engineering Co., 100 Grove St., Worcester 5, Mass., has developed a smaller model of its hydraulic jet cleaner for medium-duty cleaning. Identified as the Hydrasteam 180, it is available stationary or portable.

Source of steam is a compact steam generator. A solid jet of superheated water and detergent is propelled at high pressure. The unit is available for operation on 220, 440, or 550 v, 3 phase or 2 phase, 60- or 25- cycle power supply.

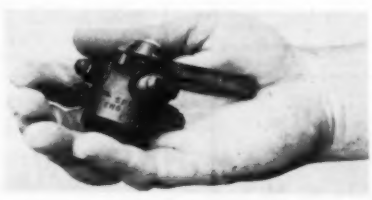
Socket Screw Wrenches

For wrenching socket screws fast, LC Wrench Co., 1149 Milwaukee Ave., Chicago 22, Ill., has come out with a line of 16 wrench sizes which are actuated by any variety of standard square drivers, either manual or power. They come in three size ranges, 1/4, 3/8, and 1/2 in. Each wrench has a knurled base for good hand turning.

4-Way Selector Valve

Production of a 2-position, 4-way selector valve for use in low pressure air or hydraulic systems is announced by Sprague Engineering Corp., Gardena, Cal. Called Model No. S-576, it is said to be leak-proof at working pressures up to 100 psi and to maintain very low handle torque. Handle stops assure positive alignment of ports.

Valve body dimensions are 2 1/2-in wide by 1 5/8-in high; overall dimensions with handle are 3 3/4-in wide by 2 5/8-in high. Weight is 6 oz. The valve is available only in 1/4-in tube size per AND 10056. Tests made by the company have indicated completion of 20,000 cycles of operation without failure. No leakage was noted with temperature of from —65°F to 160°F and with 50 psig pressure on valve.



Complete disassembly may be accomplished without disconnecting system lines.

Balancing Machine

Up to 240 or more parts per hour are claimed capable of being check-balanced with a vertical static balancing machine developed by the Tinius Olsen Testing Machine Co., Easton Rd., Willow Grove, Pa. The machine operates on the "go and no-go" principle with a minimum of operator judgment involved.

The operator simply puts the part on the balancing spindle and starts the machine. If unbalance in the part falls within the preselected oz-in tolerance, a green light appears on the control panel. A red light shows if excessive unbalance is present and the part is set aside for corrective balancing. Signal lights are controlled by a separate unit which can be set for any desired tolerance of unbalance. The machine can also be operated as a standard static balancing machine.

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His returns were so many
When he placed an ad in this section

new literature

Cleaning Electric Motors

Fine Organics, Inc., 211 E. 19 St., New York 3, N.Y., is offering a 4-page bulletin on how to clean motors and generators. Emphasis is on the use of safe solvents from the standpoints of health and fire hazards.

A reprint of an article prepared for the Society of Automotive Engineers, the bulletin considers various solvents for different stages of cleaning, gives detailed information on several types of blended solvents suitable for electrical maintenance, and suggests procedures for cleaning. Included with the bulletin is a summary of the company's safety solvents.

Testing Instruments

W. C. Dillon & Co., Inc., 14620 Keswick St., Van Nuys, Cal., has issued a comprehensive bulletin which details its complete line of products for testing and measuring. All models are illustrated along with specifications. Available accessories are also included.

Centrifugal Cast Parts

Shenango-Penn Mold Co., Dover, Ohio, has issued Bulletins 150 and 151 covering its centrifugally cast parts for use as bushings, liners, sleeves, rings, rolls, and almost any symmetrical or annular shape. Castings are in both ferrous and nonferrous metals, rough, semi-, or finish-machined.

Accident Rate Booklets

The 1954 series of accident rate booklets containing the accident experience of all companies that report to the National Safety Council has just been made available by the organization, which is located at 425 N. Michigan Ave., Chicago 11, Ill.

The booklets are published annually for each of 15 industries or groups of industries. Each volume gives current rates for the industries involved, along with a historical rundown of rates for some years back. A bar graph is also included which shows at a glance the standing of each industry with respect to 40 industrial classifications.

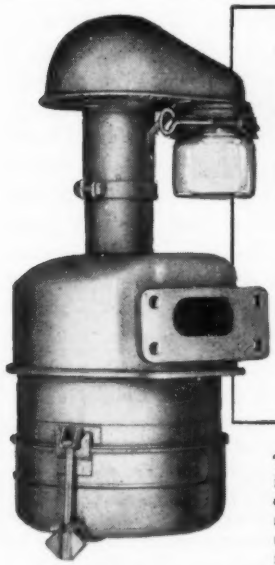
High-Capacity Gearing

Product design improvement opportunities offered gear users by its Duti-Rated gearing are presented by Foote Bros. Gear and Machine Corp., 4545 S. Western Ave., Chicago 9, Ill., in a booklet entitled "Get More for Your Gear Dollar".

Advantages claimed are detailed by comparative photos of heavy-duty transmission before and after application of its gearing. Case study applications are offered for various industrial fields, with comparison charts for hardness and wear life.

Lathe Catalog

"Machining for Profit" is the theme of the latest lathe catalog published by Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass. Ease of operation is featured and is highlighted by description of two new types of drive, a production drive permitting one operator motion for multiple functions, and a variable drive for instant selection of any speed. Accessories and attachments are also displayed.



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The simplicity and speed of servicing Donaldson Air Cleaners encourages regular attention by the machine operator. No tools are needed to remove oil cup. Cleaning cup and re-filling with oil is a two-minute job. Removable tray makes cleaning out chaff, lint, leaves and larger foreign particles simple and fast.

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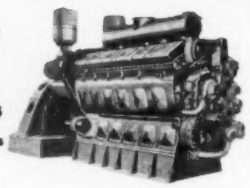

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The first edition of "Wheelabrator Tips", new publication of American Wheelabrator & Equipment Corp., Mishawaka, Ind., developed for the benefit of users of the company's airless blast cleaning equipment, is now available. It will be a continuing service, issued quarterly, and will be devoted to helpful hints and discussions on better operating methods and maintenance for the machines.

Vol. 1, No. 1 offers check points on operation and an article on preventive maintenance at American Foundry Co. Future issues will discuss methods of loading and unloading machines, reduction of materials handling expenses, devices to improve machine operation, and preventive maintenance programs at other typical plants.

Tractor Gasket List

To assist parts wholesalers and repair shops in servicing tractors and farm implements, Victor Mfg. & Gasket Co., P. O. Box 1333, Chicago 90, Ill., is offering a listing of gasket replacements for all current makes and models of engines.

Printed as a standard counter catalog insert, the listing includes replacement numbers on full gasket sets, manifold sets, oil pan sets, as well as individual cylinder head, cylinder head cover, and valve cover gaskets. Data is organized for easy reference, making it useful as an inventory check list.

Plug Valve Actuator

Just released by Pantex Mfg. Corp., Pawtucket, R. I., is a 2-color, 8-page illustrated bulletin on its new line of plug valve actuators. The line is available for remote control of all types and sizes of wrench-operated plug valves from 1 in up to 8 in.

Typical installations and detailed line drawings illustrate the bulletin. Complete engineering data is included. The actuators are powered by air or dry gas, come completely assembled, ready to attach to pipe and plug valve stem, and will operate in any position.

Speed Reducer Catalog

Brad Foote Gear Works, Inc., 1309 S. Cicero Ave., Cicero 50, Ill., announces release of a speed reducer catalog, No. 120, containing revised rating tables of its herringbone and spiral bevel-helical speed reducer line.

The 28-page catalog is printed in large type, has easy-to-read tables, and contains clear and concise instructions for the selection of the most efficient speed reducer for the job. Data sheets contain check lists of various items of information needed by the manufacturer to help determine the reducer needed.

Precision Castings

The use and advantages of its frozen mercury process for producing precision castings are presented in booklet form by Mercast Corp., 295 Madison Ave., New York 17, N. Y.

Listed as specific advantages for the process is its ability to produce closer dimensional tolerances, larger precision castings, more complex shapes, thinner-walls with larger flat areas and better surface finishes, and better control of metallurgical properties. Step-by-step photographs, pictures of finished parts, engineering drawings, and charts are included in the bulletin. A section is also devoted to basic problems of producing complex and exacting parts, solved by the process, with cost savings and design and operating efficiency.

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BOOK REVIEWS

Pipe and Tube Bending—by Paul B. Schubert; The Industrial Press; New York, N. Y.; 183 pages; $5.

Anyone concerned with the bending of pipe should be interested in this book. In it are assembled the technical data and practical know-how on the bending of both ferrous and nonferrous pipe and tube in all sizes, covering both equipment and methods for accomplishment in the shop and in the field. It is intended as a guide for the selection of the method most suitable for the particular need. Because of this, the practical and not the engineering approach has been emphasized.

Outstanding types of bending equipment available are illustrated with the operating characteristics of each described and applied to the particular job. This information makes it possible to compare both methods and equipment and select the most suitable. In addition, convenient formulas for determining length and minimum radii of bends are given showing the effect each method has on minimum radii.

A detailed chapter is given over to a discussion on the use of fillers and mandrels and another for the use of dies. Bending operations are classified into six categories: compression, draw, ram and press, roll, stretch or tension, and wrinkle bending, with a chapter devoted to each method. Another chapter concerns hot bending of large pipes and tubes. Pipe- and tube-coiling, extensively used in heating and refrigerating equipment, is described in process.

Pumps (2nd ed.)—by Frank A. Kristal and F. A. Annett; McGraw-Hill Book Co.; New York, N. Y.; 373 pages; $6.50.

Anything that flows nowadays is being pumped. In the 13 years since the first edition of this book, many new pump designs have been developed and applications extended.

The purpose of the first edition, to present a comprehensive, practical study of the different types of pumps available, and their selection, installation, operation, and maintenance, has been duplicated in character. Since today most pumps are purchased with drives on them, the chapter on drives has been omitted. Other obsolete chapters have been eliminated or revised.

Considerable space is devoted to description of the types and designs of pumps available and to applications for which they are suited, with some of the most important applications treated in separate chapters. Appropriate space is also given to the performance capabilities of the various types and their service limitations. Estimations of the head against which pumps must work, the size of suction and discharge pipes, are also worked out in detail.

The authors have tried to present the subject from a practical point of view and have avoided mathematics wherever possible. For practical purposes, the reader will learn how to order a pump to fill a specific need, how to install it for best working efficiency, how to operate it with a minimum of trouble and breakdowns, and how to locate and remedy troubles when they arise.

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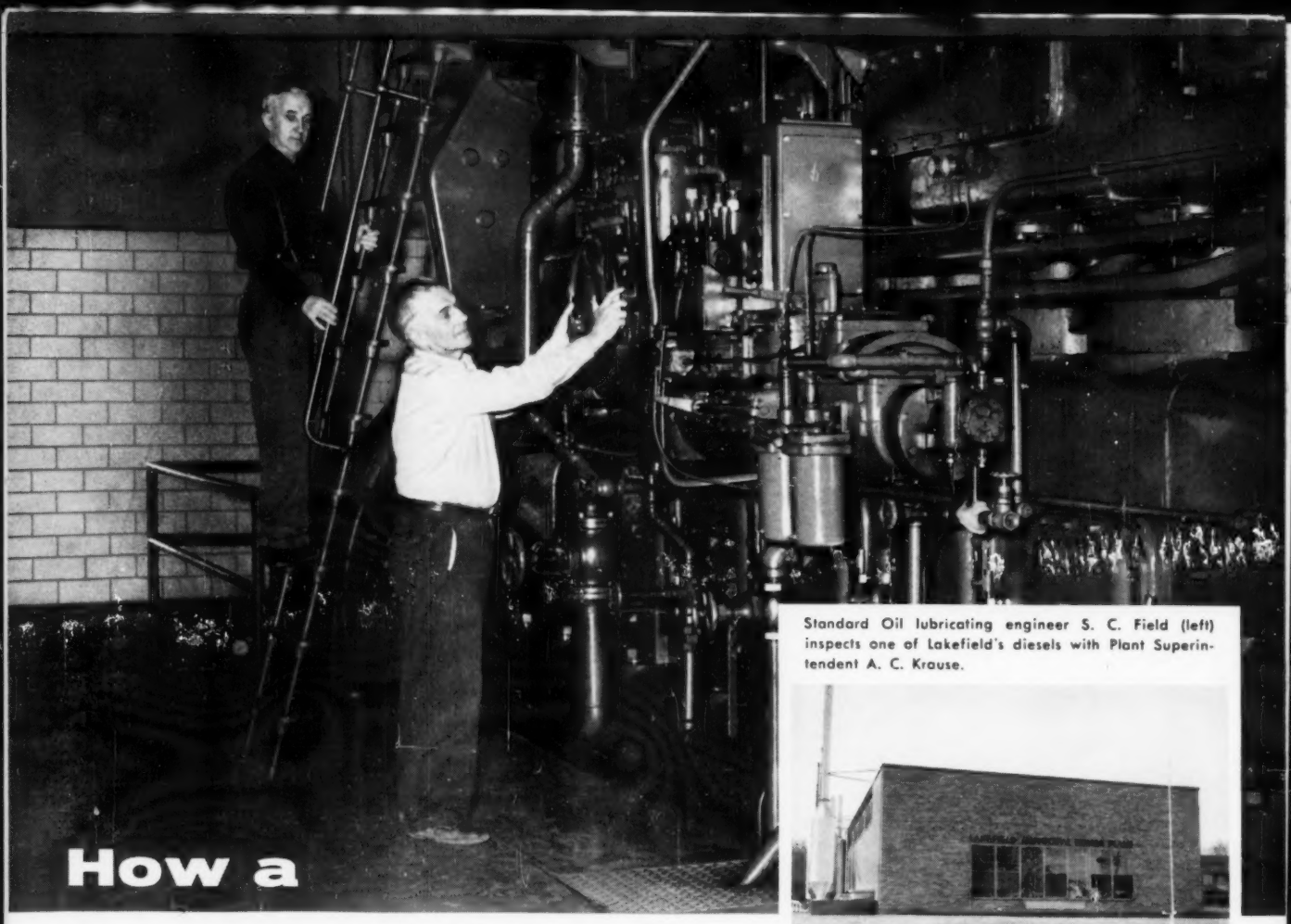
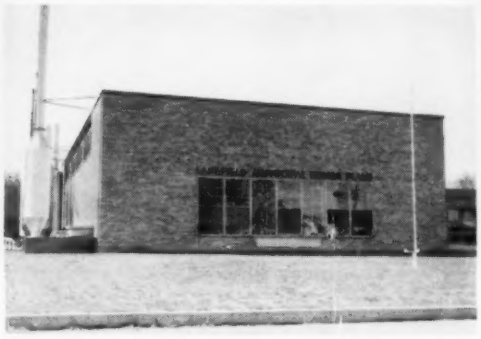


Standard Oil lubricating engineer S. C. Field (left) inspects one of Lakefield's diesels with Plant Superintendent A. C. Krause.



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